THE REFINER AND NATURAL GASOLINE MANUFACTURER

SEPTEMER, 1926

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VOLUME 5 NUMBER

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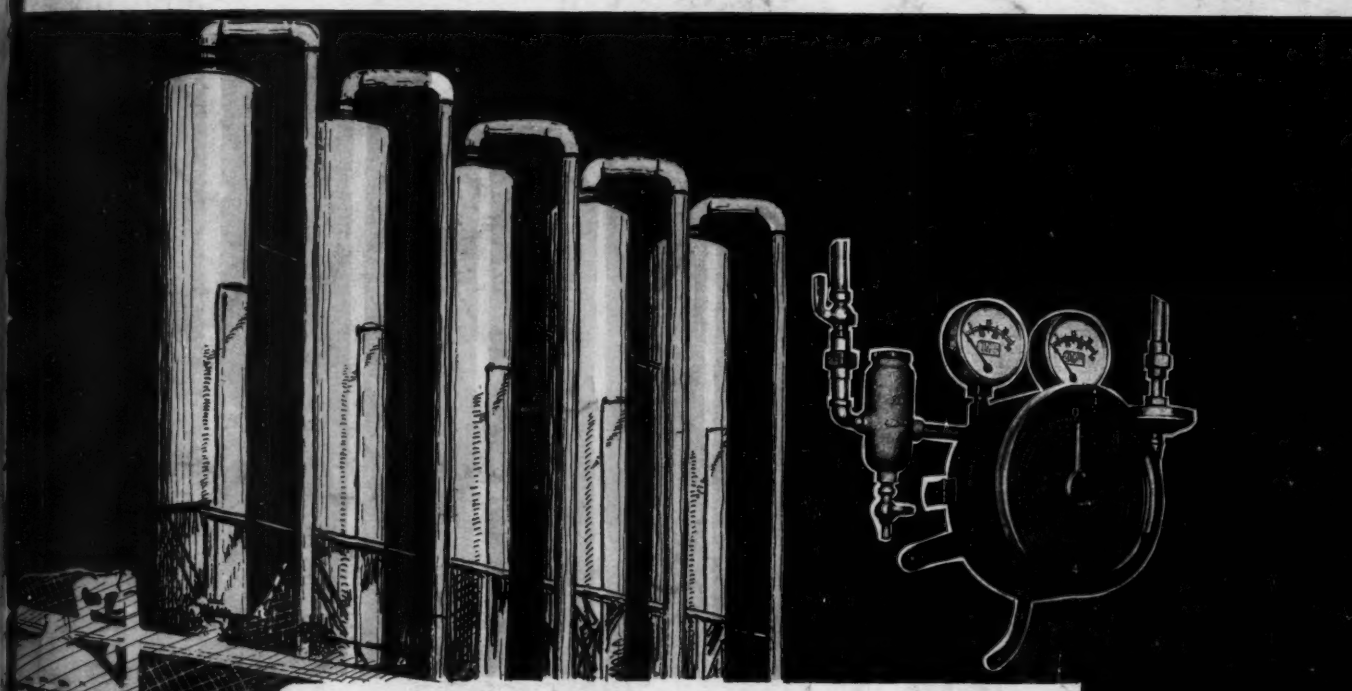


"TOWERS and TAG"

"Towers and TAG" has now become an accepted slogan in the oil industry.

A little over a year ago, refinery men began to talk about the remarkable control of fractionation effected through the use of the TAG Peerless Automatic Controller. It was as if this automatic device had been designed especially for tower work—or as if the designers of towers had taken it for granted that TAG would produce The One Right Controller.

Soon a majority of the large refineries were using the TAG Peerless Controller.

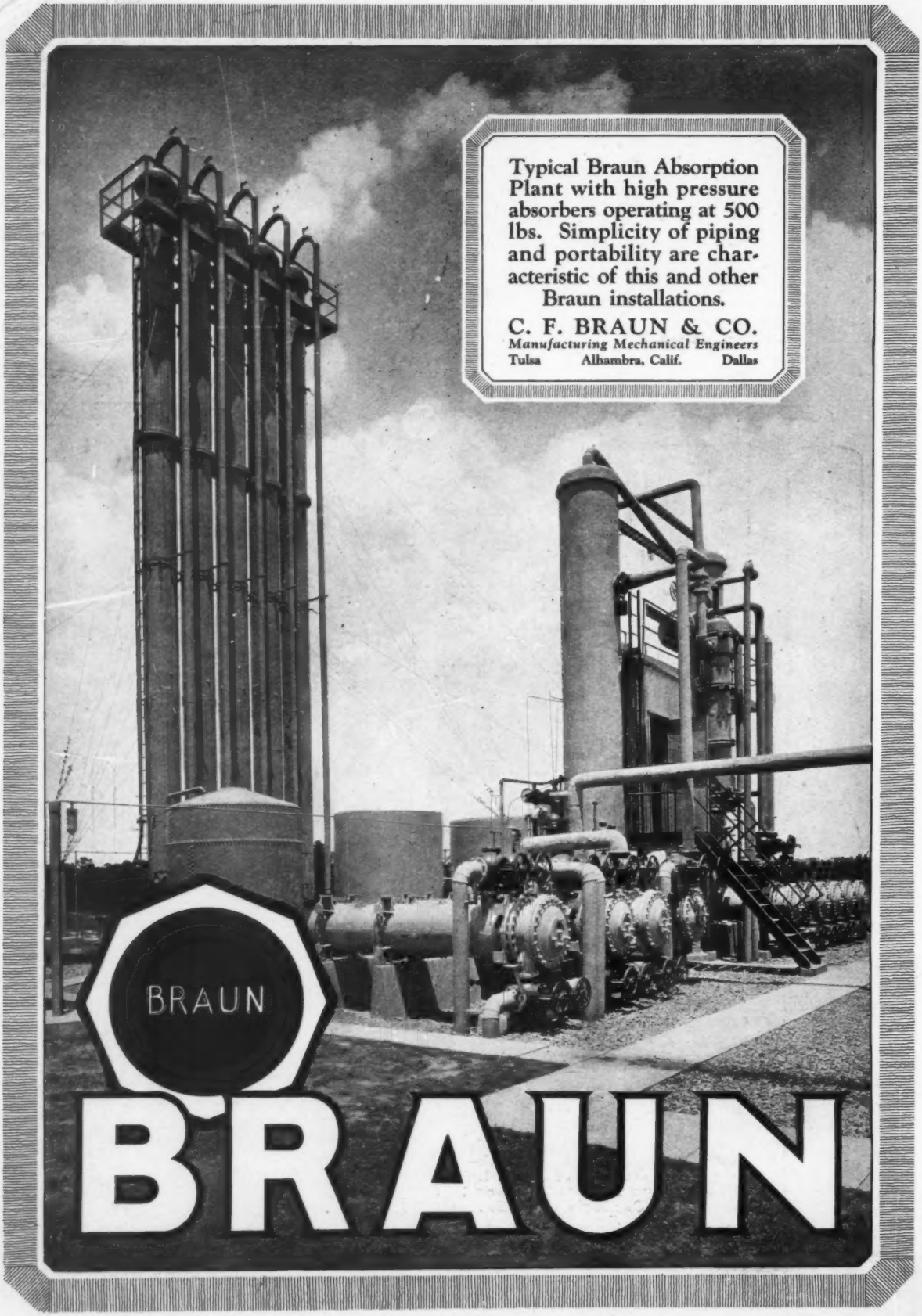
Today the best informed refinery men know for a fact that the TAG Peerless is the only device that provides the exact type of close, throttling control which is essential to the success of tower operation.

In addition to tower work, TAG controllers have been applied successfully to many other refinery processes. YOU can use them profitably. Drop a line to Temperature Headquarters and ask for catalog B-918.

C. J. TAGLIABUE MFG. CO.

18 to 88 Thirty-third St., Brooklyn, New York, U. S. A.

Branches in Principle Cities


Typical Braun Absorption Plant with high pressure absorbers operating at 500 lbs. Simplicity of piping and portability are characteristic of this and other Braun installations.
C. F. BRAUN & CO.
Manufacturing Mechanical Engineers
Tulsa Alhambra, Calif. Dallas
BRAUN
BRAUN

Entered as second class matter June 16th, 1923, at the Postoffice at Houston, Texas, under the Act of March 3, 1879.

BANROC PRODUCTS

1. Adaptable
2. Flexible
3. Permanent
4. Reclaimable
5. Efficient
6. Economical

1. Adaptable!

This is the first of a series of pages that tell the story of BANROC JACKET.

BANROC JACKET is not new to oil refineries. It has been tested and approved, and is used exclusively by some of the largest refineries in the business.

Tests prove it to be most efficient, economical, durable, to be 100% fireproof and that it is adaptable to every refining apparatus requiring heat insulation with temperatures up to 1200° F.

Banroc Jacket is made of the famous Banroc Wool, felted between rust resisting, copper bearing metal fabrics of various types to meet special conditions.

Made in special sizes to meet your requirements, or furnished in standard sizes, 2x4 ft. and 2x8 ft.

We can insulate your entire plant, or any part of it. Send us your specifications. Write for samples.

BANROC JACKET
100% FIRE PROOF
INSULATION

Banner Rock Products Company
ALEXANDRIA, INDIANA.

3 Alternatives *for* Southwestern Refiners

TAKE your choice of any one of the alternatives enumerated below. Each gives you a decided advantage—the result of freight saved on a product of local manufacture. This in brief is the story of

TEXAS Fire Brick

1st You can get the same quantity and grade brick that you are now using, for LESS MONEY.

2nd You can get MORE BRICK of the same grade for the same money.

3rd You can get the same quantity of brick, but in HIGHER GRADE, for the same money.

Quality equal to more than 85% of fire brick needs.

Write any member below for figures on your requirements.

Athens Brick & Tile Co., Athens, Texas

Elgin Butler Brick Co., Austin, Texas

Texas Clay Products Co., Malakoff, Texas

Acme Brick Co., Ft. Worth, Texas

TEXAS FIRE BRICK MFRS. ASS'N

Promoting Texas Fire Brick Economies

ADAMANT
FIRE BRICK CEMENT
Reg. U. S. Pat. Off.

is carried in stock in 100lb., 250lb. and 400lb. air tight, metal containers by these distributors:

(Distributors listed under name of city. Write distributor in nearest city.)

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The Gas Combustion Company
Baltimore, Md.
King's Coal and Supply Company, Inc.
Beaumont, Texas
Norvell-Wilder Hardware Company
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Young and Vann Supply Co.
Boston, Mass.
Waldo Bros. and Bond Company
Buffalo, N. Y.
Globe Plaster Company
Chicago, Ill.
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Rochester, N. Y.
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Wm. Summerhays & Son
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B. C. Equipment Company, Ltd.
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3,500,000 Fire Brick In One Company's Refineries Laid Up With ADAMANT

WITHIN the past three years, one of the ten major refining companies has purchased sufficient ADAMANT Fire Brick Cement to lay up more than 3,500 000 fire brick!

This refining company uses ADAMANT in building fire brick construction in cracking stills, boiler furnaces, Fuller's Earth kilns and other types of furnaces in its refineries.

Such extensive use is convincing evidence of the worth of ADAMANT for building refinery fire brick construction.

Lay up and "face" your fire brick with ADAMANT—and your brickwork will last materially longer. A mid-continent refinery found that their brickwork when laid up with ADAMANT lasted three times longer than previously.

Would you like to know more about ADAMANT? Let us send you an ADAMANT booklet and further information. Fill in and mail us the coupon below.

Logical Preference

Numbered among the plants using ADAMANT are those of some of the largest refining companies. Their preference for ADAMANT is only logical, because ADAMANT is the original high temperature fire brick cement, with the longest record of service.

ADAMANT is made in a "one-product" plant by men with a rich background of experience in the manufacture of high temperature cement.

BOTFIELD REFRACTORIES CO.
783 S. Swanson St., Philadelphia, Pa.
New York Office: 5th Floor, 110 W. 34th St.

Send The Coupon!

Botfield Refractories Co.,
783 South Swanson Street,
Philadelphia, Pennsylvania.

We want to know more about ADAMANT for refinery service. Send..... copies of the new ADAMANT booklet.

Name and Title _____

Company _____

Street Address _____

City and State _____

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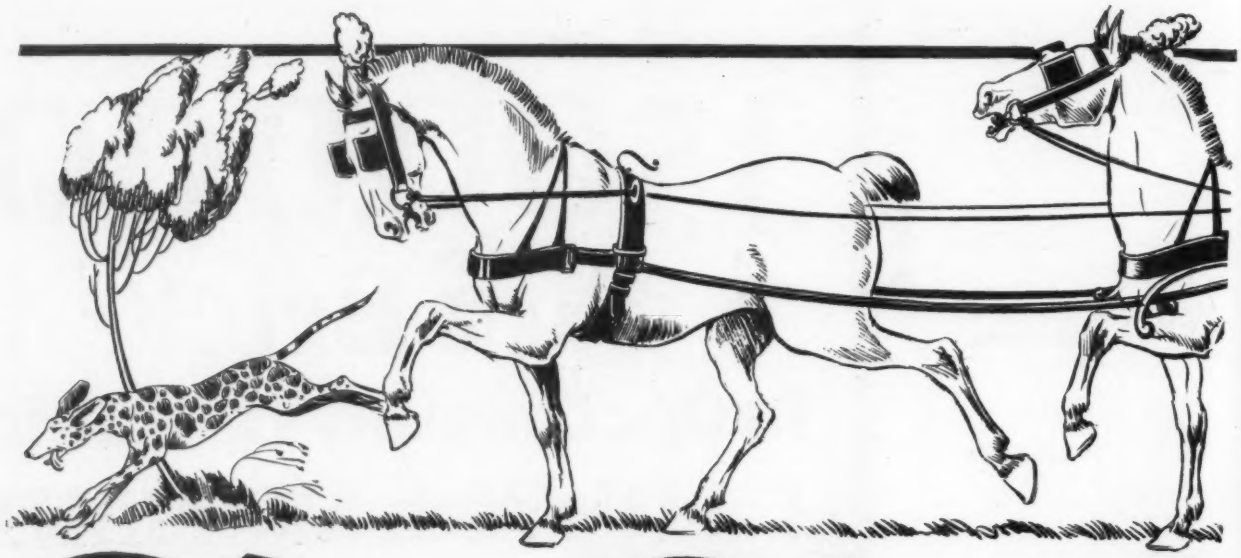
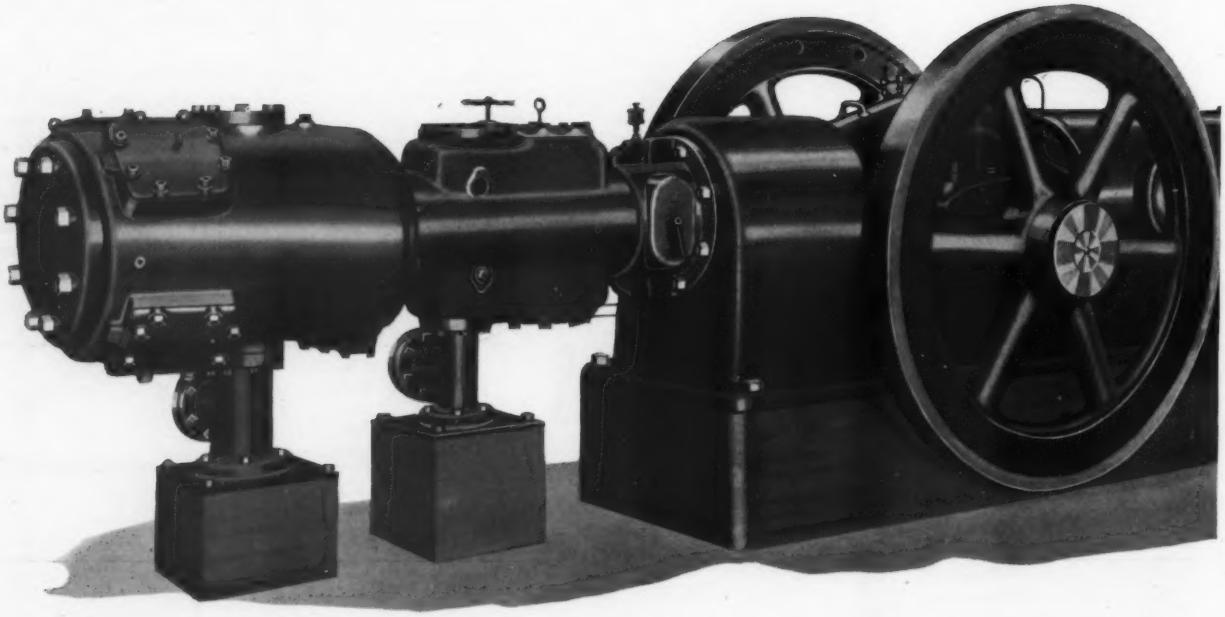


The Clark



CLARK CON

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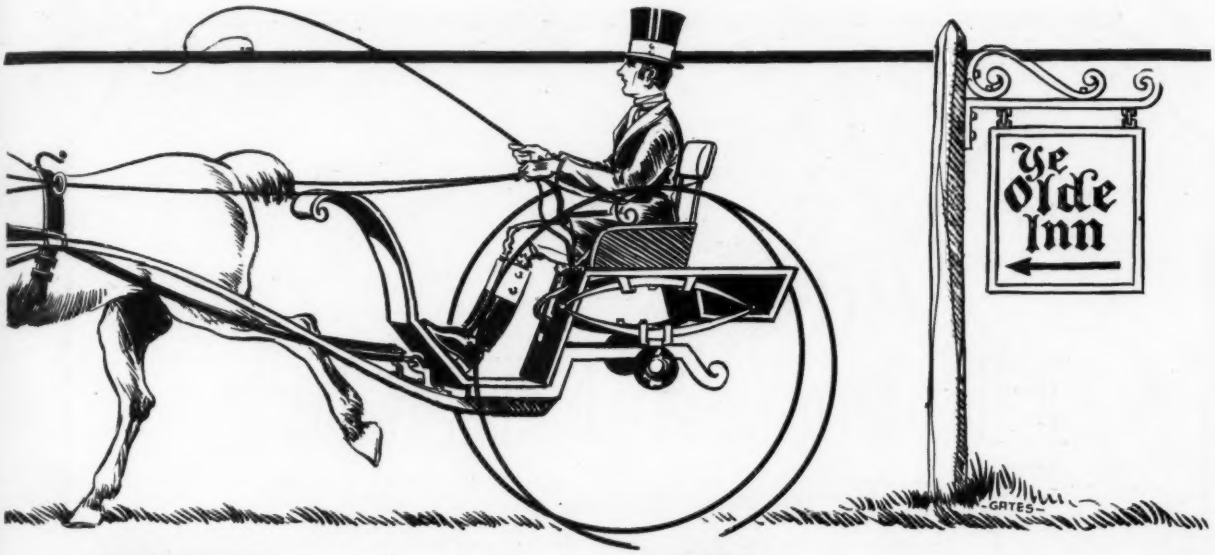
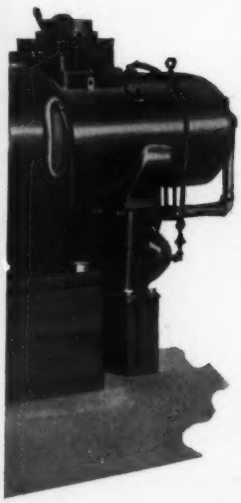


r Tandem



80 H.P. 2 stage tandem high pressure compressor—single acting 2 cycle—direct connected.

100 H.P. 2-stage tandem high pressure compressor—single acting 4 cycle—direct connected.

At the request of numerous producers who have endeavored to obtain a suitable high pressure direct connected opposed type gas engine driven compressor especially adapted to flowing wells and putting pressure on sands, we have developed the Clark TANDEM, to be used with our standard 80 and 100 H.P. engines.

By the airlift method, production can be materially increased and at the same time operating cost is substantially lowered.

A suitable combination can be furnished for *any intake and discharge pressure up to 1,000 pounds.* Another desirable feature of this new type is the fact that it combines the *simplicity* of a single stage compressor with the *efficiency* of the highest type 2-stage compressor. Ratio of cylinders gives maximum volume and efficiency. Swabbing and pulling of rods eliminated.

Write for complete information

CLARK BROS. COMPANY
Olean, N. Y.

SALES AND SERVICE

Gas Engineering & Const. Company
125 West First St.
Tulsa, Oklahoma

Smith-Booth-Usher Company
228 S. Central Ave., Los Angeles
50 Fremont St., San Francisco

McCamey and Sweetwater, Texas

MPRESSORS

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The Holmes-Manley *Cracking* Process

The gasoline yield is not only high but of a definitely superior quality.

The Licensee receives:—

1. *A Proven Process*
2. *Complete Technical Service*
3. *The Benefit of Future Developments*

Licenses Granted by

THE TEXAS COMPANY, U. S. A.

Apply to

W. S. S. RODGERS

17 Battery Place, New York, N. Y.

BOROUGH OF ASPINWALL

ASPINWALL, PA.

January 22, 1926.

OFFICE OF
BOROUGH MANAGER
230 FIRST STREET

Mr. R.M. Rush,
Elliott Company,
Steam Turbine Department,
932 Oliver Building,
Pittsburgh, Pa.

Dear Sir:-

The 500 K.W. Kerr Turbines installed by you several years ago are rendering us faithful service. Our load has increased nearly 50% since the installation of these turbines, but our coal consumption is still less than it used to be with the reciprocating engines. Our station coal consumption is now only about 3 lbs. per K.W. hour. Our record for continuous service, I believe, is better than any plant in this district.

Except for some minor repairs, the Kerr Turbines have cost us nothing and have always been ready for service.

Yours very truly,

H. C. Lea, Borough Mgr.

faithful service
economy
continuous service

Characteristics of

KERR TURBINES

TURBINE SALES DEPARTMENT
WELLSVILLE, N.Y.
DISTRICT OFFICES
ATLANTA, BALTIMORE,
BOSTON, CHICAGO,
CINCINNATI, DETROIT,
CLEVELAND, NEW YORK
KANSAS CITY, ST. LOUIS,
PHILADELPHIA AND
** PITTSBURGH **

ELLIOTT COMPANY

PRODUCTS
STEAM TURBINES,
REDUCTION GEARS,
DEAERATORS, HEATERS,
CONDENSERS, AIR
EJECTORS, AUTOMATIC
& NON-RETURN VALVES
BLOW-OFF VALVES,
GREASE EXTRACTORS,
STRAINERS, SEPARATORS

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Lower Your Operating Cost

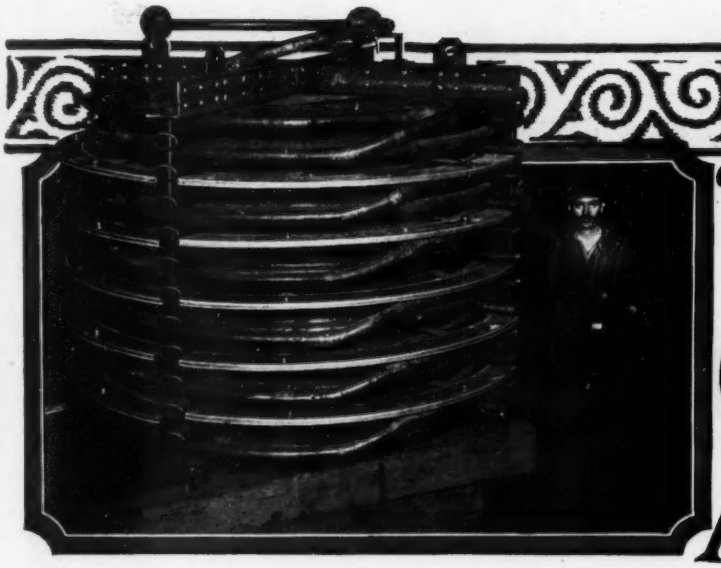
THE daily service you get from your refinery equipment has much to do with your operating expense. The super-strength and durability of KAW Products makes certain of maximum service at lowest cost. The trouble-free operating qualities of KAW high pressure stills, storage tanks, etc., have been proven through actual service in the field. Investigations show that only time can determine their lasting ability—for many, installed years ago, continue to serve as well now as the first day they were used.

Lower your operating cost. Be sure of trouble-free service every day. Eliminate costly delays and upkeep expense. Write, wire or phone for money-saving specifications and prices.

KAW STEEL CONSTRUCTION CO.

General Office and Plant:

1st and Walker Ave., Kansas City, Kans.



"The Best Coil Job I ever inspected"

SUCH was the unsolicited report of our customer's field superintendent when he had completed a careful inspection of the coil shown above.

This superintendent had us apply a 2000 pound hydrostatic test pressure to the coil. There were no leaks—not even a sweat—on the first test. But his inspection was not only for tightness, it also included accuracy of dimensions and quality of workmanship.

It is interesting to know that no special precautions were taken in the Midwest Shops during the fabrication of this coil. This is simply another way of saying that: **All precautions are taken in the fabrication of all Midwest Coils so that they are absolutely tight, accurate in dimensions and have highest grade workmanship.**

Midwest engineering and shop facilities are complete in every detail, their location is advantageous, and a very large stock of steel and wrought iron pipe is always carried on hand. The significance of all this is that you get not only a coil job comparable with the one shown here but the time between placing your order and the shipping date is reduced to a minimum.

Therefore, when you need pipe coils—write, wire or phone Midwest.

MIDWEST PIPING & SUPPLY COMPANY

Second and Miller Sts.

SAINT LOUIS, MISSOURI

Tulsa Office: 805 Mayo Building

Chicago Office: 208 South La Salle St.

Fabricators of Oil Refinery, Natural Gasoline Plant and Power Piping

MIDWEST Pipe Coils

I told you boss! The flanges ought to be forged steel

HOW small the cost of Pennsylvania Forge Flanges compared to the losses that result from leaking joints! Damage to valuable stock—costly shut downs—unnoticed wastes of power that dissipate profits!

Why invite these losses? You wouldn't risk being without fire insurance.

Pennsylvania Forge Flanges are a positive guarantee of perfectly sealed joints and freedom from leaks. The fitter knows he can't break them—and does not hesitate to pull them up tight enough. No matter how frequent—or how violent—the variation in temperatures, no harm can come to a Pennsylvania Forge Flange. And this applies to all strains and shocks, internal pressure, expansion and contraction, water hammer, vibration, blows from falling objects, etc.

Ductile as the pipe itself—tensile strength, 60,000 lbs. per sq. in.—elastic limit, 30,000 lbs. per sq. in.—flawless machining and threads—that's Pennsylvania Forge Flanges.

Huge stock and tidewater location mean unusual service.

PENNSYLVANIA FORGE COMPANY
PHILADELPHIA

Distributors

Houston, Texas: Harrisburg Pipe & Pipe Bending Co.
St. Louis, Mo.: W. R. Maxwell, 915 Olive St.
Phila., Pa.: Ford & Kendig Co., 1428 Callowhill St.
Boston, Mass.: E. B. Badger & Son Co., 75 Pitts St.

The strength of the line is only the strength of the Flanges

AUTHORITATIVE DATA BOOK FREE!

48 pages of valuable information about pipe lines. Write for your copy today.

PENNSYLVANIA FORGE CO.

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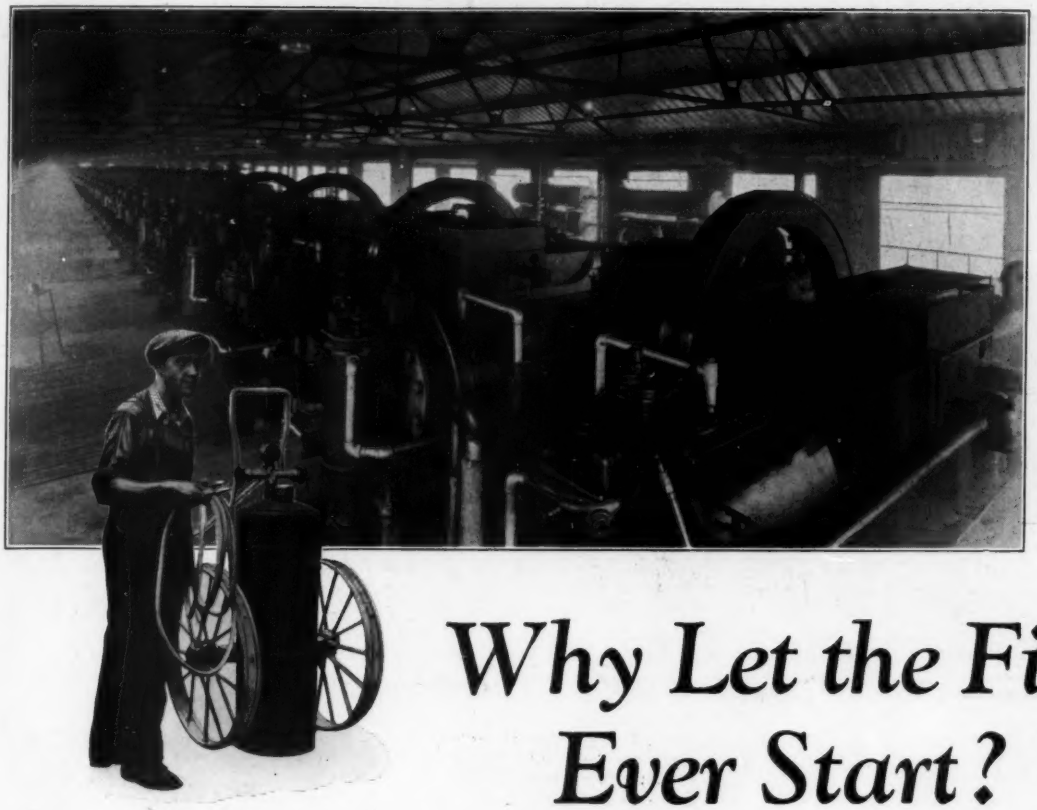


Why Let the Fire Ever Start?

Also made in Stationary Type with Automatic Sprinkler Head

KEEP an Oceco Fire Extinguisher handy for quick action and nip the blaze in the bud.

One of the biggest natural gasoline manufacturers, after testing all types of extinguishers on the market, has purchased over 50 Oceco Extinguishers.

The Oceco is safe on electrical equipment and non-freezing. It ejects 10 gallons of liquid by an equal quantity of air under pressure of 100 pounds. This pressure discharge is sufficient to allow operator to remain a safe distance away from fire.

Offered on 30-Day Test

So efficient in all tests made by many large concerns who have used it, that we will ship one of these extinguishers to any responsible company for a thirty-day test, with privilege of returning, if not found to give thorough satisfaction. Let us quote you.

THE OIL CONSERVATION ENGINEERING COMPANY
877 Addison Rd. *Headquarters for Tank Equipment* Cleveland, Ohio

ENGINEERING AND SALES SERVICE AT:—

25 Broadway, New York
325 Iowa Building, Tulsa, Okla.
O-S Building, Casper, Wyo.
W. K. Henderson Co., Shreveport, La.
Neilan, Schumacher & Co., Los Angeles, Calif.
Arthur Dooley, Box 552, Beaumont, Texas

OIL TANK OCECO EQUIPMENT
SAVES EVAPORATION AND PREVENTS FIRE

Mention Where You Saw the Advertisement

The bigger picture shows one of the combustion chambers in operation. The smaller picture shows the entire furnace shut down.

910

The names
will be glad
request.

Big oil companies install the Plibrico Diffusing Furnace under their stills because it makes four economies!

1 Overheating and buckling of still bottoms is absolutely overcome. The flame is confined to the doghouse combustion chambers and does not reach the still bottom.

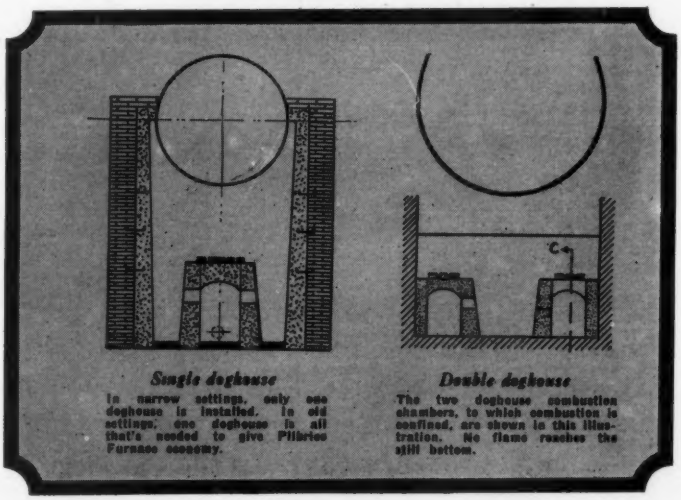
2 Fuel costs are decreased. Because combustion is confined to the tunnel-like combustion chambers it is more complete. CO_2 reaches almost 14%.

3 A uniform temperature—not possible where stills are direct-fired—is maintained the entire length of the still. The still can be kept at the proper temperature always.

4 Because the Diffusing Furnace is built of double-life Plibrico—the jointless, plastic lining—refractory maintenance costs are sharply cut. Plibrico outlasts firebrick at least 100%.

DO you want to know the cost of Plibrico Diffusing Furnaces for your stills? We'll gladly furnish it. Send us blueprints or dimensioned diagrams of your stills. Our engineering department will make up blueprints and cost estimates. If the still brickwork is in good condition only the installation of the doghouse combustion chambers may be needed; this change can be made at very low cost.

There will be no charge or obligation of any kind if we make up blueprints for your refinery. We're anxious to show you at just how small a cost you can have these four economies for your stills.



Single doghouse
In narrow settings, only one doghouse is installed. In old settings, one doghouse is all that's needed to give Plibrico Furnace economy.

Double doghouse
The two doghouse combustion chambers, to which combustion is confined, are shown in this illustration. No flame reaches the still bottom.

P.S. Plibrico, the plastic furnace lining, is ideal for repairing still and boiler furnace linings of any kind, coal, gas, or oil fired. If furnaces are in need of repair, try a drum or two of Plibrico. It's plastic. Anyone can pound in Plibrico. You'll be surprised at the life of the repair. You'll want to replace all fallen firebrick with it. It's just as good for complete fronts, oil burner cones, bridge walls, and sidewalls, as it is for minor repairs. Stocks in 85 cities. 24 hour service anywhere.

PLIBRICO JOINTLESS FIREBRICK CO., 1159 Clay Street, Chicago
Factories: Chicago and Trenton, N. J.

The PLIBRICO Diffusing Furnace

—for old or new stills, oil or gas fired

WE INVITE YOUR INQUIRIES

on technical subjects pertaining to

MEASUREMENT and CONTROL and CONSERVATION and SAFETY PROBLEMS

Every member of our engineering staff is especially fitted by years of actual experience and association with the Oil and Gas Industries, to capably handle any problem which you may submit for solution. Feel free to call upon us, at any time, without obligation.

Products Manufactured and Distributed by **WESTCOTT & GREIS, Inc.**

WESTCOTT ORIFICE METERS

METRIC IRONCASE METERS

LIQUID SAFETY VALVES and companion line of tank equipment

MERIAM MANOMETERS and companion line of Meriam Products

CHAPLIN-FULTON high and low pressure regulators

MACDONALD 2 Lt. 3 diaphragm Meters equipped with 4 purging cocks for laboratory and charcoal testing

DAVIS SUPERSENSITIVE RELIEF VALVE AND CASINGHEAD REGULATORS

BRISTOL'S CHARTS AND RECORDING GAUGES

KREB'S LEVELLING SADDLES

Complete stocks of orifice meter repair and replacement parts

The technical man is important to the Oil and Gas Industries. Through his broad knowledge of operating situations, he is able to suggest economies that mean substantial savings to operators, and the promotion of a more ideal condition throughout the Industry.

Savings, in time, labor and money, are important to you; consult our engineering department the next time you are faced with a particularly intricate problem regarding the operation of your measuring and control devices, or your conservation and safety equipment.

WESTCOTT & GREIS, Inc.,
Dallas TULSA Los Angeles

Westcott and Greis Inc.

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Stamina Counts in the Oil Industry!

STRENGTH, RIGIDITY, POWER OF ENDURANCE—THESE ARE THE FACTORS WHICH DETERMINE THE ULTIMATE COST OF YOUR VALVES.

The increasing necessity for lower operating costs in the oil industry is constantly influencing the installation of only such equipment as will render continuous satisfactory service with the least amount of attention and minimum maintenance expense.

LUNKENHEIMER "CLIP" GATE VALVES

have earned their place among the preferred equipment by paying their way in economical and trouble-free service.

They are sturdily constructed of the very best materials; Iron Body Bronze Mounted for steam, water or oil service, and All-Iron for handling fluids which attack bronze but not iron.

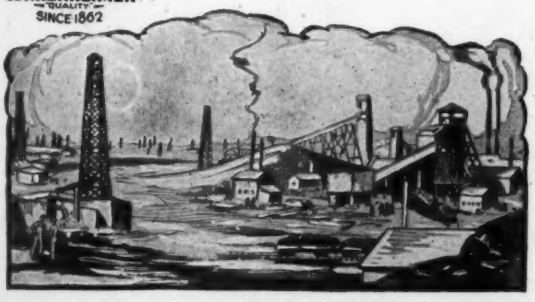
Lunkenheimer "Clip" Valves not only withstand 100 lb. W. S. P., but also the stresses caused by expansion and contraction, vibration, weight and settling of the pipe, and other severe service conditions.

Simplicity of design permits of quick and easy disassembling for cleaning or repairs, and the renewability of all parts subject to wear materially prolongs the life of the valve as a whole.

Distributors of Lunkenheimer Products are located in all oil producing centers. They can fill your requirements promptly from stock.

AMERICA'S BEST
LUNKENHEIMER
"QUALITY"
SINCE 1862

The Lunkenheimer **"Guide to Better Service"** is a handy reference book, conveniently arranged to enable you to find at a glance, Valves and Engineering Appliances for any service. **A copy of this interesting book is yours for the asking. No obligation. Just fill in and mail coupon.**



THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO BOSTON LONDON
EXPORT DEPT. 129-135 LAFAYETTE ST., NEW YORK

Please send me, without obligation, copy of "Guide to Better Service."
THE LUNKENHEIMER CO., Cincinnati, Ohio
P. O. Box 878, Cincinnati, Ohio
Name _____
Firm _____
Position _____
Address _____

5-28A-80

Mention Where You Saw the Advertisement

FISHER
TRADE MARK
REGISTERED

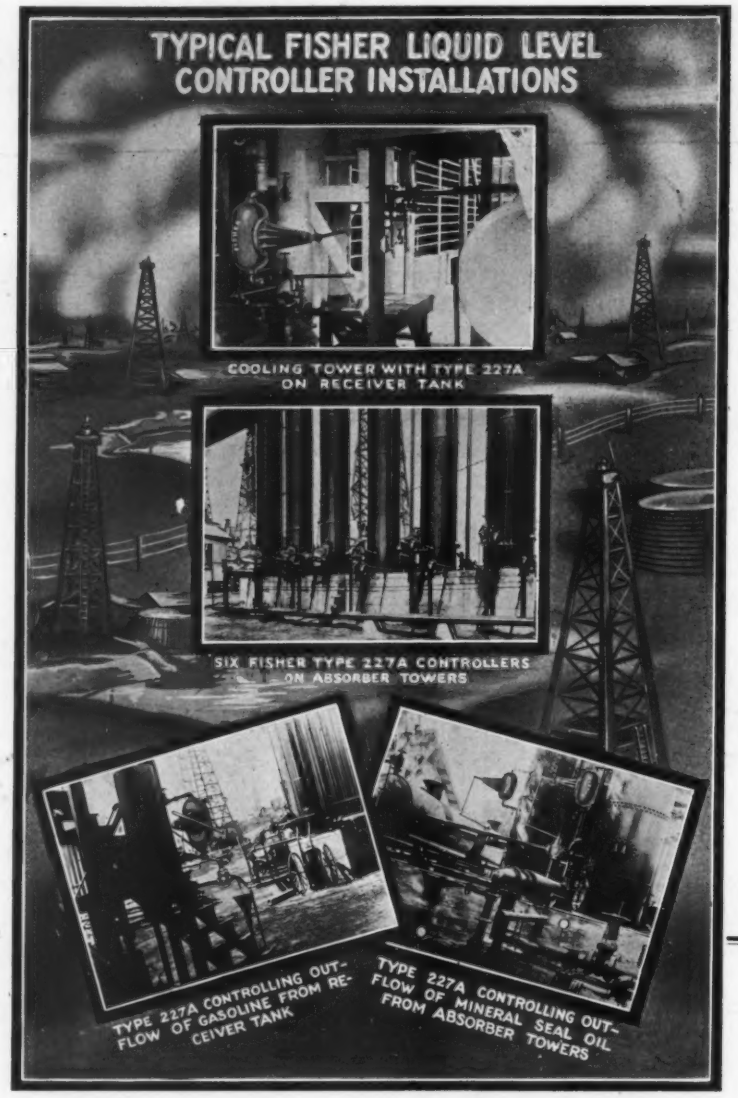
LIQUID LEVEL
CONTROL
TYPE 227A

Used on tanks where it would be impossible to apply an internal float valve—

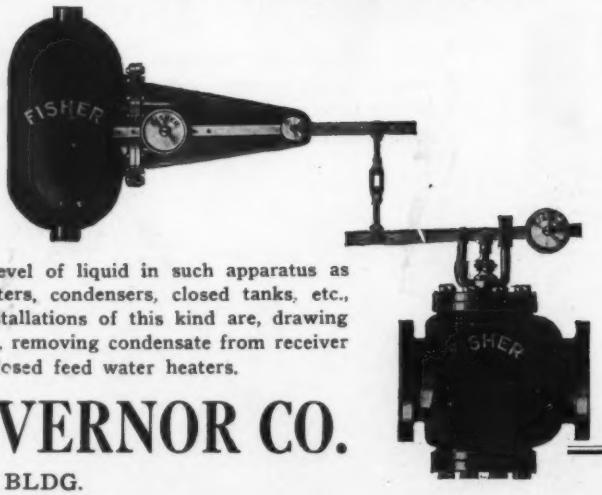
Where surging of the liquid prevents the use of an inside float valve—

Will control the level of liquid in a piping system when installed on a vertical pipe—

Used as a continuous drainer in handling large volumes of condensate from evaporating pans, open or closed heaters, condensers, etc.


TYPICAL FISHER LIQUID LEVEL CONTROLLER INSTALLATIONS
COOLING TOWER WITH TYPE 227A ON RECEIVER TANK
SIX FISHER TYPE 227A CONTROLLERS ON ABSORBER TOWERS
TYPE 227A CONTROLLING OUTFLOW OF GASOLINE FROM RECEIVER TANK
TYPE 227A CONTROLLING OUTFLOW OF MINERAL SEAL OIL FROM ABSORBER TOWERS

King Canute was defiant—



But defiance did not stop the rising tide. The control of liquids is a job for engineers who understand their laws and whims. The laws relating to hydrostatics as announced by Pascal are fundamental, and these fundamentals are made to serve the oil industry through devices designed and manufactured by The Fisher Governor Company.

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SEPTEMBER, 1926

The REFINER
AND NATURAL GASOLINE MANUFACTURER

Edited Monthly at Tulsa, Oklahoma — GRADY TRIPLETT, *Editor*

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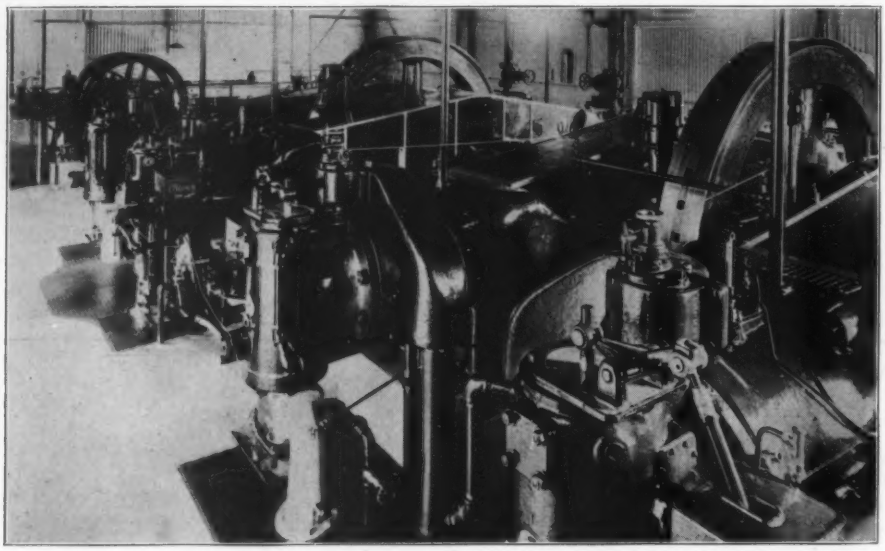

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Mid-Continent Refiners to Form Export Selling Corporation

Webb-Pomerene act offers outlet by which plant operation may be made more stable

By Grady Triplett

FORMATION of an export corporation, with independent Mid-Continent refining concerns as members, went forward another step here September 1, when a committee was appointed to work out details and submit its findings at another conference.

The meeting here followed one in Kansas City earlier in the month.

Members of the special committee are George D. Lock, vice-president of the Barnsdall Refineries, Inc., Chicago, chairman; E. J. Marston, vice-president of the Texas & Pacific Coal & Oil Co., Fort Worth; D. E. Buchanan, vice-president Chestnut & Smith Corp., Tulsa; Walter K. Campbell, president Western Petroleum Corp., Wichita Falls; and F. A. Pielsticker, vice-president of the Skelly Oil Company, Eldorado, Kansas.

This committee will meet at the call of the chairman. The next session likely will be held in Tulsa, although this has not been determined.

Foreign Contracts Desired

THE purpose of the movement is to bring at least 20 Mid-Continent refiners into an export concern, organized under the Webb-Pomerene act. Through such an organization it is hoped that contracts for gasoline and other products can be made abroad to such an extent that a share of plant capacity can be kept constantly devoted to filling these demands.

Contrary to a general impression, no effort is being made to build additional facilities at tidewater for handling petroleum products for this concern. At the meeting here the common opinion seemed to be that sufficient facilities already exist at Gulf ports for handling whatever business may be developed through the operations of the export concern.

If carried through as now contemplated, the export organization will give refiners a chance to sell abroad under conditions differing from those under which their products now reach other countries. Concerns now engaged in selling abroad frequently call upon the refiners of the Mid-Continent area to furnish large quantities of gasoline and other products for export.

Under this condition, the independent refiners never know what demands may be made for such products over a year, or for a season. The call for export gasoline may come when stocks are low, forcing a sudden increase in runs, if advantage is to be taken of this market.

Stable Operation

BY forming a corporation under the Webb-Pomerene act, it is intended to so arrange export selling that plants can be turned to devoting a known share of monthly or annual runs to filling the demand from this source. The export concern will function as a sales agent, making contracts abroad for other refined products, as well as gasoline. Since these contracts will cover long periods, refiners can know what amount of these materials to supply each month.

In the past two years Mid-Continent refiners have accomplished much toward overcoming what is known as "seasonal demand." An export organization, functioning properly, will allow still further stabilization of manufacture.

It will give additional known demand over a period, while in the past refiners have operated their plants to a great extent to supply an unknown demand, since sales were dependent on domestic consumption, plus whatever the exporting companies might need from independent refiners.

The Webb-Pomerene act was passed in 1918 for the purpose of allowing manufacturers to form export organizations, which can function in selling merchandise abroad without bringing member companies under the restrictions of either the Clayton or Sherman acts, which are generally classed as the anti-trust laws.

Moving Slowly

THERE are many such concerns now functioning. None, however, has been formed within the petroleum industry. In recent years too, the independent refiners have been without the services of some private export concerns, which formerly served the Mid-Continent territory. These concerns were formed for selling abroad and depended largely upon supplies from Mid-Continent independent refining plants. These concerns have either been sold or have passed out of the field.

George D. Locke, vice-president of the Barnsdall Refineries, Inc., is the prime mover in the formation of the export organization. He is convinced that such a concern can serve the Mid-Continent refining industry to good purpose. Concerning the formation of the corporation he said:

"We are making headway in our plans for an export outlet for the independent refiners of the Mid-Continent. I am confident that an export company will be formed but it will be only after we are satisfied that the step is right and proper."

Representatives of 18 refining concerns attended the Tulsa conference. At least 20 are wanted for formation of the export organization.

Think It Over

Out in California a workman in a refinery garage finished changing a tire. Instead of removing the jack in the proper manner, he backed up to the front wheel, lifted the weight off the jack and let it fall.

By that he had his job completed in two minutes quicker time than by properly removing the jack. But, and this is from The Record of Associated Oil Company:

"He invested in a bad case of hernia, and before he was able to go back to work he lost forty-four days' time, not to mention the cost of $337.66 to the company for medical attention and compensation."

How a Plant Was Brought Back to Efficient Operation

Reduced gas supply problem met by converting old equipment into modern type

By George Reid
Staff Representative

SOME five years ago the Gilmore Oil Company erected a gasoline absorption plant at Long Beach, California, building one of the earliest installations for the manufacture of gasoline from natural gas in the Signal Hill area. About this time, it will be recalled, the Long Beach district was fast assuming the proportions of a major oil field, and natural gas was plentiful. With the beginning of construction of the Gilmore gasoline plant, naural gas producers began offering gas for gasoline manufacture until contracts were on hand necessitating the construction of a much larger plant than was originally contemplated. Instead of a 10,000,000 cubic feet gasoline plant, as intended, the company contracted to run 23,000,000 cubic feet of natural gas daily. The installation of absorption towers to handle this large volume of gas is shown in Figure 1. Four or five years ago the best engineering practice dictated that one absorption tower 50 feet in height and 4 feet in diameter was capable of handling and stripping two million cubic feet of gas daily—therefore there are ten of these absorption towers comprising the original Gilmore installation.

This plant was constructed and put into operation, just as scores of others of the same type were designed and operated, before present engineering principles and the modern compact and efficient plants, were understood and developed. This plant, like many others of its type, produced many thousands of barrels of gasoline profitably, before conditions arose which made it necessary to effect certain changes in construction—to modernize the installation with the aim of reducing cost of production and to increase the proportionate yield. It is the purpose of this writing to deal with this improvement program and to note the results secured by the installation and change of certain items of plant equipment.

Up Against Less Gas

The thistory of this plant is similar to that of the majority of like installations—great quantities of gas, operation at well pressure—then less and less gas, with the installation of booster plant, (in this instance, four twin Bessemer engines, 165 H. P., and Ingersoll-Rand compressors, 16 inch by 20 inches) pulling vacuum on the wells and delivering gas under pressure to the absorption equipment.

After the supply of natural gas was reduced to about 4,500,000 feet daily and this volume of gas was available in an assured constant supply for future operations, then the improvement in plant efficiency was undertaken with the view of increasing the recovery and of decreasing operating costs. One of the earliest steps in this direction was the installation of a tail gas recovery system. An item of economy is shown in connection with this system in that one side of one of the compressors used in the booster plant is handling tail gases alone from the plant yard. This compression chamber is 11 inches by 16 inches and is operated at 60 pounds pressure per square inch for compression of the rich tail gases. The other half, or side, of the same compressor operates at 30 pounds per square inch compressing the wet gas from the field. In this manner the purchase and installation of a separate tail gas compressor was avoided.

The tail gas compressor pulls a vacuum on the gasoline tanks, accumulator tanks, and in addition derives a certain amount of wet vapors from the loading rack. The vapors are regulated in volume by passage through a dry gasometer, which is merely a regulating device working on the diaphragm principle, then they are conducted through one of the spare absorption towers, which is employed as a separating or cleaning chamber where vapors are stripped of any impurities, foreign matter, or entrained oil, before they enter the compressor. The compressed vapors are discharged to cooling coils and the condensate removed in a small accumulator tank. This tank is dumped to storage automatically, being controlled by a Fisher liquid level controller. The vapors or gases released at the accumulator tank are conducted to the scrubber tank and returned to the absorption system to be released with the residue or dry gas after the second passage through the absorption tower.

The weathering tanks are the source of supply of other vapors or gases bearing gasoline, but instead of processing them through the tail gas recovery system they are handled through the main absorption plant. All of the weathering tanks and blending tanks, (the plant blends a large amount of finished gasoline for local distribution) deliver spare vapors to a separate absorption tower through a gasometer. The storage and handling tanks

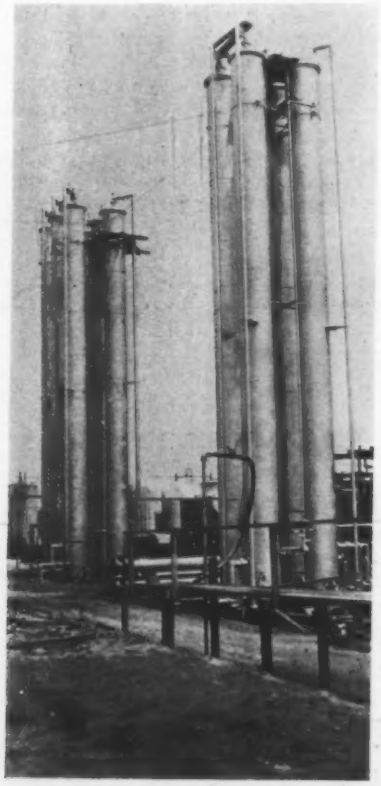


Figure 1.—Center of plant showing absorbers, preheaters, scrubbers and gasoline storage tanks.

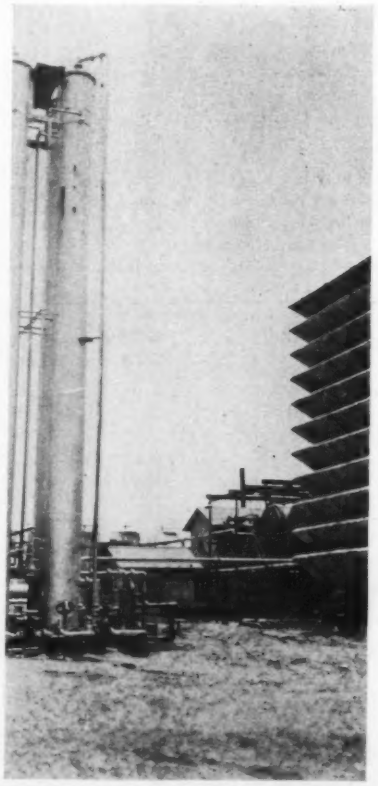


Figure 2.—Absorption tower converted into bubble type tower.

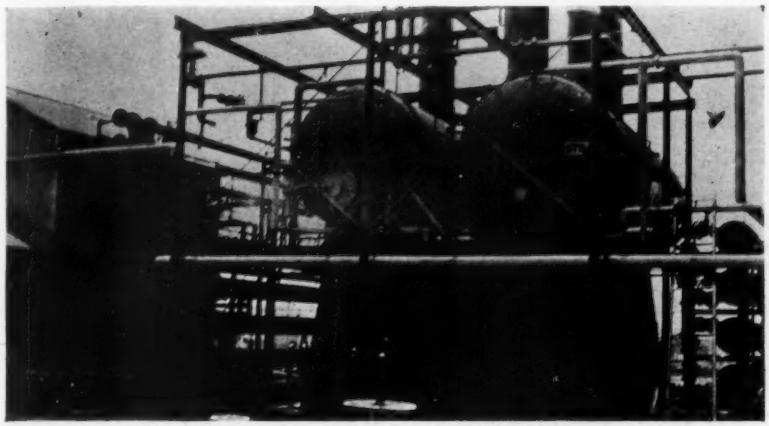


Figure 3.—Steam still, auxiliary still and exchangers.

for absorption oil are also equipped with gas or vapor removal lines, and any vapors which might be present in the fat or lean absorption oil are removed and conducted to the second absorption tower. From this tower the vapors are conducted to the incoming wet gas scrubber, to pass through the booster plant and the absorption plant a second time. These two absorbers employed as described above are used as separating chamber only, and are so employed because of the fact that they are extra equipment which would not otherwise be in use. The installation of the tail gas recovery systems increased the plant production materially and reduced the operation loss. In the manner described all of the light vapors are caused to pass through the absorption plant two complete cycles and they are thus stripped completely of all marketable gasoline.

Economical Improvement

The absorbers being of the former conventional wood baffle type were known to be inefficient to a certain extent, and this condition needed correction. Again, economy was desired—and instead of purchasing the latest type of bubble or froth absorption towers, with ten absorbers already on the plant yard, the company decided to convert one of the 50 feet high wood baffle towers into a semi- or partial bubble tower for experimental purposes.

In Figure 1 the tower used for this purpose is shown unheaded at the top with the gas outlet line disconnected. Figure 2 shows the same tower after the work was completed. The wood baffle material was removed from the tower to a depth of about fifteen feet from the top and in this fifteen feet, five bubble trays were placed. This tower was converted to a very efficient bubble type tower for a cost of about $200.00, and in addition to securing better efficiency and selectivity in the tower, the entire supply of natural gas, approximately 4,500,000 cubic feet daily, is handled through the single absorber. So the experiment was attended by success and over twice the volume of gas is handled in one tower, with much greater efficiency than that volume indicated by engineering practices some four years previous.

Flow System

The oil and gas flow at this plant is similar to that of practically all gasoline plant installations. The compressed gas leaving the booster plant is first cooled from 225 deg. F. to 78 deg. F. in a series of coils in the water cooling tower, from where it is conducted to the absorbers. The absorption oil enriched in this operation is then conducted to a series of interchangers, one of which is shown at the right of the steam stills in Figure 3. In these exchangers the fat oil is raised in temperature from about 85 deg. F. to 215 deg. F. In this same operation the lean oil leaving the still is reduced in temperature from around 280 deg. F. to 130 deg. F. to be further cooled in coils to 75 deg. F. The fat oil leaving the exchangers is conducted to the preheaters (shown just back of the first four absorber towers in Figure 1) and then to the steam still or vaporizer. Only one still is employed in distillation work, the second still being auxiliary and manifolded for use in emergency cases. Live steam, the volume of which is controlled by a mercury manometer indicating the inches of steam being employed; is used to agitate the oil in the still. Distillation is effected at a temperature of about 300 deg. F. The liberated gasoline vapors are conducted through the dephlegmator, condensed and taken to the gasoline and vapor separator where the tail gases are removed to the recovery system as previously described.

The fractionation equipment or dephlegmators, as installed in the original construction was never satisfactory. Principally, the equipment was too small and necessitated the simultaneous operation of both steam stills. Also the design was of such a type that real efficiency was never secured. To correct this condition and to improve operation efficiency the company installed a Campbell dephlegmator at the top of the water cooling tower. This dephlegmator is very simple in design, operation and control. The liberated gas, agitation steam, and any entrained oil is conducted to a four inch header to be diverted into eight 2-inch horizontal lines thirty feet long. The end of the first flow of 30 feet the vapors enter a second header, are conducted to a third header of the same size, again separated into eight 2-inch streams and returned in a parallel flow through 30 feet of 2-inch lines to a fourth four inch header where they converge into one stream.

The 60 feet of flow is horizontal and the two inch lines are surrounded by water. The volume of water used over these pipes controls the temperature of the apparatus and also the partial condensation. The vapors are sufficiently cooled in this coil-like equipment to condense all of the steam into water, all of the heavy entrained oil and all heavy particles governing the end point of the gasoline. Very little water is required for control purposes.

One Still Eliminated

The cooled vapors leaving the last header are conducted to the bottom of a small knock-out chamber where the condensed particles are dropped. The fourth 4-inch header is also provided with a drain line for the removal of any condensate accumulating in the horizontal lines. All of the condensed material gathering in the knock out chamber is removed to a tank at ground level where the water and oil separate upon settling and are thus reclaimed. The gasoline vapors leaving the last chamber are then condensed and conducted to storage as previously described.

The installation of this dephlegmator eliminated the use of one steam still and gave greater ease of operation and control than was previously possible, with an appreciable decrease in the amount of steam required for preheating and distillation. The improvements, as outlined above, which have been effected in this plant are indeed worthy of note, and are of interest in that a remarkable increase in efficiency has been secured, and plant operations are greatly improved in the ease of hndling the equipment.

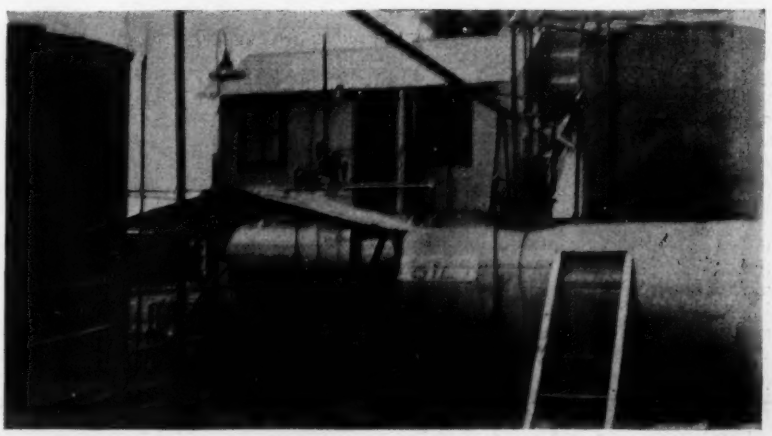


Figure 4.—Accumulator tanks and absorption oil storage

Bone burner and filter house, Okmulgee plant, Empire Refineries, Inc.

Wedge Type Kiln Revivifies Fuller's Earth

Empire Refineries Inc. finds efficiency not impaired from frequent burnings

THE Wedge type of kiln which has been successfully used for some time in the chemical and metallurgical industry for roasting ores has now been adapted to refinery use for revivifying Fuller's earth or "bone." It is a distinct advance in refinery practice.

With the Wedge type of burner the various unsaturated hydrocarbons and other impurities retained by the earth are removed by a combination of the familiar processes of distillation and burning. While with either the vertical or angle gravity-drop type burner or the rotary type burner there generally results a more or less decrease in the action of the earth after successive burnings, it has been found that with the Wedge type of burner that the efficiency of the earth is not impaired by subsequent burnings.

Figure No. 1 shows the cross-section of the Wedge burner recently installed by the Empire Refineries, Inc., at the Okmulgee, Oklahoma, plant. At first glance it might possibly appear to belong to the general class of angle gravity-type burners but it has incorporated in it many features that really place it in a type by itself.

Operating Method

The burner is a round structure 16 feet in diameter and 32 feet high containing seven separate roasting hearths. Along the side of the roasting chamber are two combustion chambers in which the primary fuel is burned to produce the hot gases for heatinng the earth.

The Fuller's earth is introduced at the top of the roasting chamber from overhead storage through two charging holes. It feeds down through the chamber in a zig-zag manner, passing over the seven hearths. About 1½ hours are required for a given particle of earth to be completely processed.

The earth feeds down through the burner by rabble arms equipped with scrapers. The rabble arms are air cooled and are rotated by a center shaft supported on a step bearing. A 10 H. P. motor working through reduction gears drives the center shaft and a 3 H. P. motor drives the blower which supplies the air to cool the rabbles.

As shown in Figure No. 1, the flue gases from the two primary combustion chambers are introduced from both sides into hearths 2, 3, 5 and 6.

As the earth travels its zig-zag course over the hearths and down through the chamber it is gradually increased in temperature until the third hearth is reached. At that point the temperature is such that the impurities contained in the earth start burning and help to maintain a short period of elevated temperature.

Heat Under Control

Such action continues until the sixth hearth is reached. At that point combustion stops and partial cooling commences. The seventh, or next hearth is equipped with water cooled plates for further cooling the earth.

As with other types of burners, auxiliary cooling equipment is not needed. The earth coming from this burner is sufficiently cooled to be ready to run directly to storage by a conveyor belt.

At no time, it will be noted, does the earth come into direct contact with the flame of primary combustion in the side chambers. Another feature of the method is the precise control over the process at all times.

Provision is made for controlling the flue gases entering each hearth by individual dampers. Large air doors for the introduction of air are also provided to prevent overheating. The rate of combustion may be delayed after the combustion temperature has been reached in

the lower hearths by the admittance of primary air.

By these means the earth is maintained at the proper temperature for the length of time sufficient to remove all the impurities without "burning" or damaging the earth in any way.

Little Storage Required

Since the efficiency of the earth is not impaired by subsequent burnings the only bin storage necessary with this type of burner is for new or unburned earth, burned earth and spent earth. With other types of burners it is often necessary to keep the earth from each subsequent burning in separate bins, it will be recalled.

No earth is discarded as with the older systems and the only new earth required from time to time is the "make up" for losses due to handling, stack escape, etc. These losses are very small, it ought to be mentioned.

Not only with this type of burner is action most efficient and the investment in bin storage and conveying equipment reduced to a minimum, but operating labor is less and the time required to dump, clean and get a filter back into service can be materially decreased.

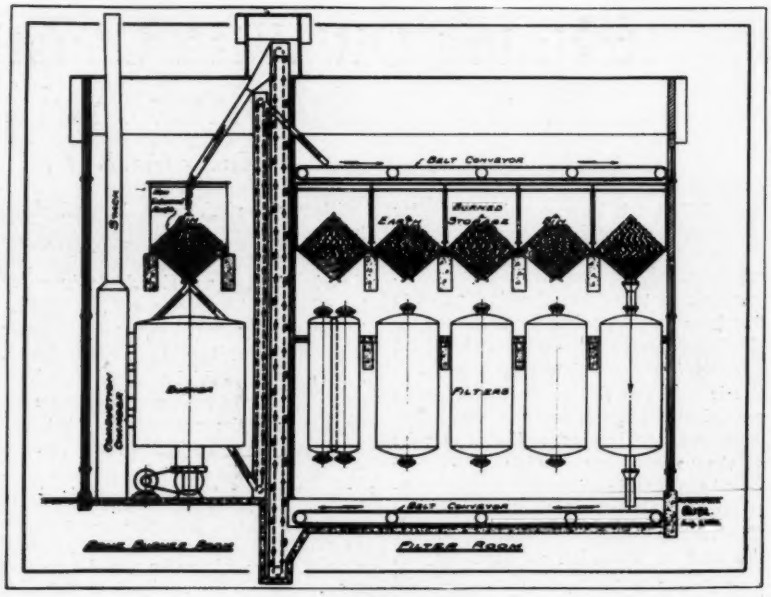


Figure 1

Cross-section of Bone burner and filter plant.

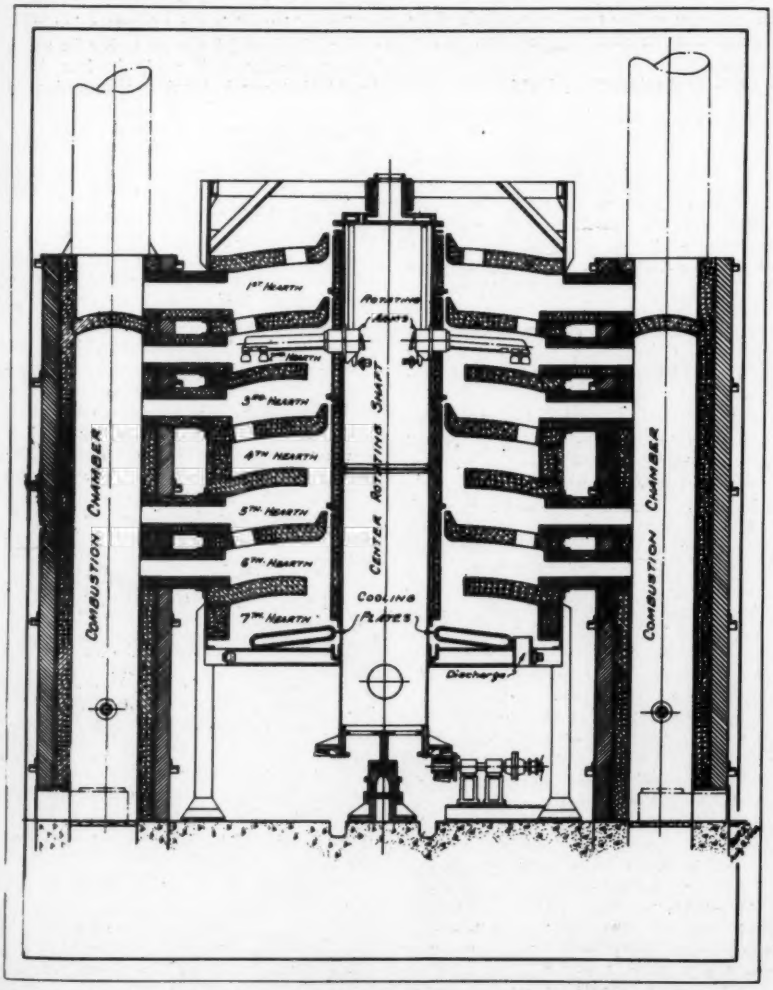


Figure 2

Wedge type burner installed by the Empire at Okmulgee, Oklahoma, for Revivifying Fuller's Earth.

As a result of the operation of the Wedge burner at the Okmulgee refinery, the Empire Company is proceeding with the installation of a similar burner at its Ponca City refinery to replace the present rotary burner.

Gasoline Improving in Quality Says Bureau Of Mines

Washington, D. C.—Gasoline sold in the principal cities of the country this summer was of a higher quality than observed in any summer in the past seven years, it was stated by the Bureau of Mines in announcing the results of its 14th semi-annual motor gasoline survey. The investigation covered the ten representative cities of New York, Washington, Pittsburgh, Chicago, New Orleans, St. Louis, San Francisco, Laramie, Wyo., and Bartlesville, Okla.

The gasoline marketed this summer was apparently more volatile than that sold in the summer of 1925, it was stated, and, in fact, the average volatility of the summer product was almost the same as the average volatility of the gasoline marketed last winter. "Improvement in gasoline quality," it is declared, "is indicated particularly at the lower end of the distillation range and at the end point. The central and upper parts of the distillation range are not far different from those of gasoline previously marketed."

A detailed study of the different analyses indicates that the improvement in quality is due to two factors: first, to a large percentage of samples with relatively low initial and end points, and second, to an improvement in the volatility of some of the benzol blends marketed in different parts of the country.

Refining Oil With Caustic Soda and Sulphur Acid

By Ismar Ginsberg

LAST month in an article of similar title we considered the technology of the caustic soda process for the refination of mineral oils. This month our task is to outline the developments that have recently taken place in the sulphuric acid refining process. It has been mentioned beforehand that the use of sulphuric acid for this purpose still forms one of the primary fields in which this important acid is employed, this in spite of the various new refining agents that have been introduced on the market within recent years and of the difficulties and disadvantages that surround the use of the acid in oil refining, particularly in view of the loss of oil values and the trouble encountered in disposing of the sludge acid.

A word might first be said in connection with the mechanism of the sulphuric acid refining process. It is known that sulphuric acid will refine the oil. This is a practical fact but here is a case where the practical fact is well known while the theoretical operation of the process is not so well-known. Perhaps this is primarily responsible for the difficulties that have been met with in this process. It is known however that the action of sulphuric acid on the hydrocarbons in the mineral oil is a very complicated one.

Thus it has been said that the action is mainly chemical, and that this is indicated by the large consumption of the acid, for example approximately 25 per cent in the case of kerosene and 45 per cent in the refination of a machine oil. Another indication is the large amount of sulphur in the acid tar, more than was originally present in the oil itself. The generation of sulphur dioxide gas is also an indication of chemical action.

Absorption Theory

There is also another theory which says that the acid acts by absorption. Thus the asphaltic ingredients are absorbed from the oil by the acid. Thus in the use of concentrated acid for refining, it is stated that an equilibrium will be reached at a certain point, whereupon the addition of water will cause some of the asphaltic impurities to dissolve back in the oil, while the addition of more acid results in further impurities being removed from the oil. Furthermore it has been indicated that the refining action of the sulphuric acid is enhanced by lowering the temperature which is usual with purely physical adsorption phenomena. On the other hand it is well-known that a reduction of the temperature always results in a slowing up of chemical reaction. These facts led to the conclusion that the colored impurities of the oil are absorbed by the sulphuric acid and this process proceeds up to a certain saturation point without there being any chemical reaction involved.

In the German article which was published on this general subject in Petroleum Zeitschrift, 1926, pages 751 ff., there is contained quite a lengthy discussion of the relative merits of the various theories of the action of sulphuric acid on mineral oils. From the various polemics on this subject and the observations that have been made by various investigators, it may correctly be concluded that the action of sulphuric acid on the impurities in the mineral oil is primarily a chemical one. In other words the sulphuric acid actually saponifies these impurities, and then these substances exert an adsorbent action on the oil ingredients. There is thus a double action and it would appear that this theory is well substantiated by the various results that have been obtained by experimentation along these lines.

Action Two-Fold

The next question is just how does the sulphuric acid exert its chemical action on the mineral oil ingredients. It is known that both paraffine and naphthalene, at the ordinary temperatures of refining, are not acted upon by ordinary sulphuric acid or fuming sulphuric acid, when these hydrocarbons are in the pure condition. The unsaturated hydrocarbons are those that are most easily attacked by the acid. The action is of two-fold character and a distinction must accordingly be made between the formation of sulphuric acid ethers and polymerization.

Polymerization of the mineral oil explains clearly why the oil that is treated with sulphuric acid experiences an increase in its specific gravity. For example it has been found that a kerosene, which had a specific gravity of 0.815 before polymerization, increased to 0.820 after treatment with the acid. Furthermore, it is well-understood that the action of the sulphuric acid on the resins and asphaltic ingredients that are contained in the mineral oil is one of polymerization as well. The naphthenic acids are partially dissolved in the acid resinous mass that is obtained by this treatment and another part as well as the phenolic bodies are sulphonated. As a whole it must be said that the action of the concentrated acid on the naphthenic acids contained in the oil is not a very potent one. Thus investigators have found that in a machine oil which was treated with 3.5 per cent of concentrated sulphuric acid, there was still seventy per cent of the naphthenic acids present. Finally the sulphur compounds that are present in the mineral oil are dissolved or absorbed by the acid, but the exact mechanism of this process is not known. Acid of ordinary concentration has no effect on the aromatic hydrocarbons in the oil, but fuming acid will convert them into sulphonic acid derivatives.

Concentration Important

One of the most important considerations in the refining of mineral oil with sulphuric acid is the concentration of the acid. Thus when the strength of the acid is less than sixty to seventy per cent, it will be found that it has but little action on the oil constituents. As the concentration of the acid increases, its activity increases and it is also found that the higher the concentration the less of the acid is required to produce a certain result. Thus the refining action obtained with five per cent of a ninety per cent acid is not as great as that obtained with three per cent of a ninety four per cent acid.

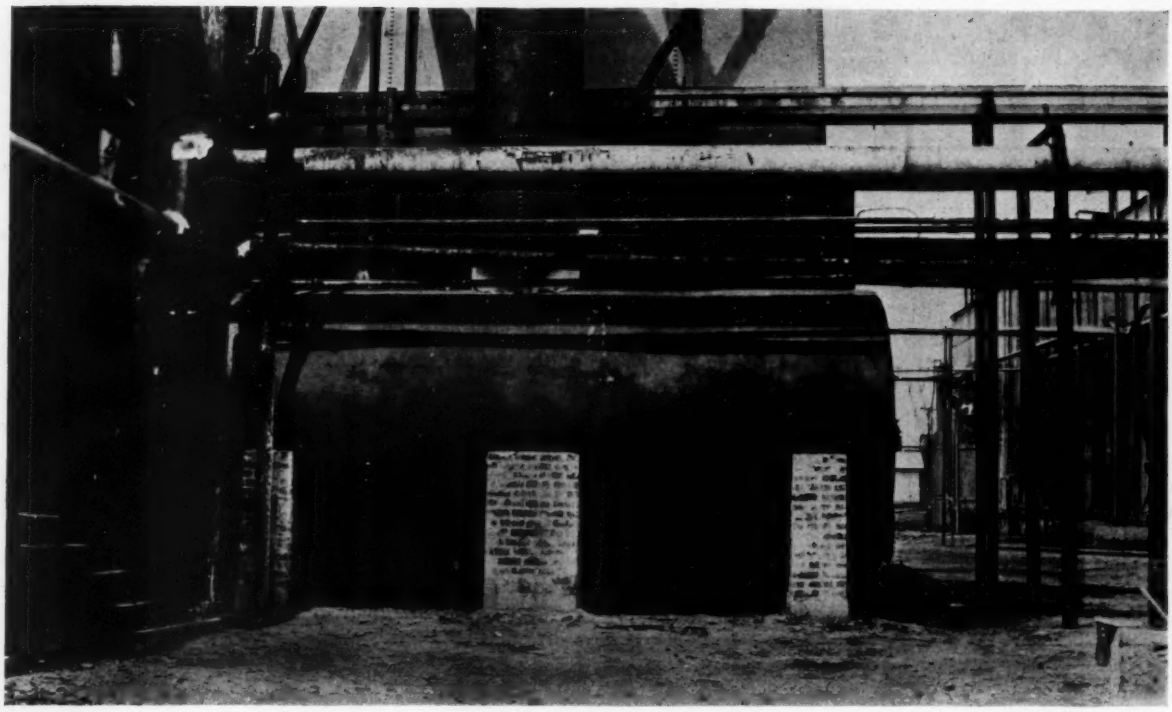
The acid used has a concentration generally of 93 to 94 per cent, for in using higher concentrated acid, it has been found that much trouble ensues due to the ease with which the acid congeals. In the refining process it is best to add the acid to the oil in several portions. Thus about one half per cent by weight of acid is first added in order to remove the water and the ingredients that most readily react with the acid. Then the acid resin is removed from the oil and the latter is treated with the principal quantity of acid. This operation can also be carried out in several stages.

Oil that has been treated with an insufficient amount of acid will have the odor of the crude product and will also darken. On the other hand when the oil has been treated with too much acid, it assumes a reddish shade, which then changes into a brown and finally becomes a black. Over-treated oils will tend to become acid, and this generally happens when the oil is exposed to the air at the ordinary temperature. For further reference to this matter the reader is referred to Erdoel und Teer, 1925, number 35, page 11.

The treatment of mineral oils with the aid of fuming acid is quite a different matter. This acid possesses high oxidizing powers and when it is used in the refining of oils large amounts of sulphur dioxide are evolved. A greater proportion of sulphonic acid is formed with this fuming acid than with ordinary sulphuric acid. The acid attacks the aromatic hydrocarbons which are not sulphonated by the common acid.

In using fuming acid or oleum for refining it is advisable to remove first the easily reacting constituents. Thus United States Patent No. 1,521,283 describes a process in which the oil is first treated with four to twenty-five per cent of the ordinary acid and then with fuming acid.

(Continued on page 72.)



Fractionating exchange at American Refinirg plant

Fractionating Exchanger Increases Gasoline Yield

By Ralph E. Goode

THE value of the heat exchanger is well known and there are many different types in use but something unusual in a type of fractionating exchanger has been installed in connection with the crude stills at the American Refining Company's plant at Wichita Falls. This exchanger operates at the comparatively low temperature average of 230 degrees F. and removes a stream of 4½ per cent to 5 per cent of 75.0 gravity gasoline from 36.6 gravity crude charging stock. The still is horizontally placed and near the crude stills. The dimensions are approximately nine feet by 20 feet, and the tower three feet by 16 feet and is placed in the center of the still.

The exchanger is equipped with six liquid levels and a temperature and pressure recorder and is completely insulated. The construction is such that a heating coil for steam may be installed and a larger per cent of light gasoline removed if desired. The tower is uninsulated and is baffled six feet up from the bottom and from there is filled with crushed rock for a knockback up to within a few inches of the top. There are two four-inch vapor lines placed on opposite sides of the tower and the manhole at the top of the tower is equipped with a pressure release valve. The condenser box is built large enough to take care of an added number of cooling coils necessary because of the unusually light vapors which pass through it. There is very little vapor loss as the coils are kept cool and the look box in the receiver-house is gasket tight and kept clamped down.

Charging Plan

Crude petroleum being charged to the stills is first preheated in the towers of the Power Pipe still unit going from them to the heat coils and from them into the regular heat exchanger. From the regular heat exchanger the crude is forced into the new fractionating exchanger where the separation of the light gasoline takes place. The gasoline going up through the tower into the cooling coils and from there into the receiver house and then into storage. The crude bottoms off the exchanger are fed into the towers in continuous operation as No. 1 Crude Tower, No. 2 Crude Tower, No. 3 Crude Tower and No. 4 Crude Tower in the case of a five crude stills arrangement and approximately half way up. The crude stills operating then in the regular order.

The capacity of the fractionating exchanger is equal to the capacity of the crude stills and in this case at present is taking care of an approximate 6000 barrels daily crude charge. The value of this fractionating exchanger to the refinery lies in the fact that the per cent of gasoline recovered from the crude charged can be increased two per cent and the crude will be fed into the stills with fractionation unretarded. The fuel saving in firing the stills is also considerable due to the fact that the crude is preheated and the charge is at and above its equilibrium boiling point. The equilibrium boiling point of a liquid is the temperature at which the balance between the liquid and the vapor may produce a change, the liquid being at the vapor stage.

The pressure on the fractionating exchanger does not exceed three pounds and there is no tendency for the still to surge or vomit. The crude stills are run for 450 degrees F. end point and blended back with 410 end point gasoline from the rerun stills which gives a high quality—100 degrees F. initial boiling point, 437 degrees F. end point and Government Specifications for "navy" gasoline.

The product of the fractionating exitchanger may be used in different ways if it is desirable to cut the product to separate storage. The initial boiling point of the product of the fractionater averages 95 degrees F. and the end point 340 degrees F. The temperature range on a distillation shows—10 per cent over at 122 degrees F., 20 per cent over at 134 degrees

F., 50 per cent over at 176 degrees F., 90 per cent over at 280 degrees F., and a two per cent distillation loss. The sulphur content is negligible and the gasoline may easily be treated if desirable, using only a light caustic wash and rendering it "doctor" and corrosion proof.

Cost Low

The cost of installing one of these units is small compared with the profit to be gained by its use as any refiner is aware that an increase of even one per cent in gasoline recovery above that of the usual run will make itself felt in increased profits and profit above the cost of operation is the one thing the refining industry is more in need of at the present time than at any other time in refinery history.

An old discarded still if it is not weakened in any way through the action of rust or corrosion may be repaired with the aid of the acetylene welder and put into condition for use in this connection. The tower also may be made of any suitable discarded apparatus at small cost. If a second hand or discarded apparatus is to be had and the plant is equipped to place this material in condition for still operation the total cost of labor, material and incidentals should not exceed $8,000, and a first class unit of the above description will be had.

If the refinery has been recovering 40 per cent of "navy" gasoline from the barrel of crude charged and this is increased with the aid of the exchanger to 42 per cent gasoline recovery the cost of the plant will be soon overcome as the figures for this would show:

Cost of 36.6 gravity crude per barrel	$2.29
Value of 58/60 gravity Gasoline; 40 per cent recovery	1.93
Value of fuel oil bottoms; 60 per cent cent recovery	.88
Total value refined crude	$2.81
Value refined crude	$2.81
Cost of crude charged	2.29
Profit with 40% gasoline recovery	$ .52
Value of 58/60 gravity gasoline; 42% recovery	$2.03
Value of fuel oil bottoms; 58% recovery	.84
Total value 42% refined crude	$2.87
Value of refined crude	$2.87
Cost of crude charged	2.29
Profit with 42% gasoline recovery	$ .58
Profit with 42% gasoline recovery	$ .58
Profit with 40% gasoline recovery	.52
Profit per barrel with use of Exchanger	$ .06

It can readily be seen that a profit of six cents per barrel on the crude charge will soon take care of the small outlay necessary for the installation of an exchanger of the above description. However the profits shown here through refining a barrel of crude petroleum do not take into consideration maintenance and labor cost although the maintenance and labor cost are not increased with the use of the fractionating exchanger.

Many Refining Units Being Installed By Graver

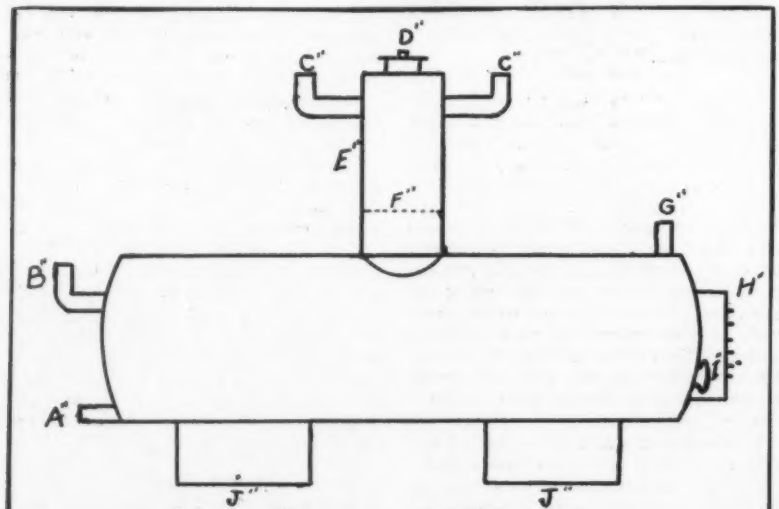
East Chicago, Ind.—Graver Corporation of this city announces the sale of three units of the Schultz Vacuum Process for the manufacture of lubricating oil to the Ogura Oil Company, Yokohama, Japan. This equipment will be installed at the Yokohama refinery of this company where a Jenkins Cracking Process was recently placed in operation.

The sale was made through the Asano Bussan Company, of New York, American representatives of Ogura.

The Golden Rule Refining Company has also contracted with Graver for the installation of one 1000 barrel unit Jenkins Cracking Process to be installed at their Wichita, Kansas, refinery.

Garber Refining Company have under construction at the present time one 1000 barrel unit Jenkins Cracking Process at their Garber, Oklahoma, refinery.

This equipmnet was sold and is being installed by Graver Corporation.



Diagramatic sketch of shell exchanger
A-Pump out line to crudes.
B-Charging line.
C-Vapor lines
D-Manhole and release valve
E-Tower
F-Baffle plate
G-Pressure gauge
H-Liquid levels
I-Manhole for clean out and steam coil.
J-Exchanger support

Extensive Shale Experiments Planned by Bureau

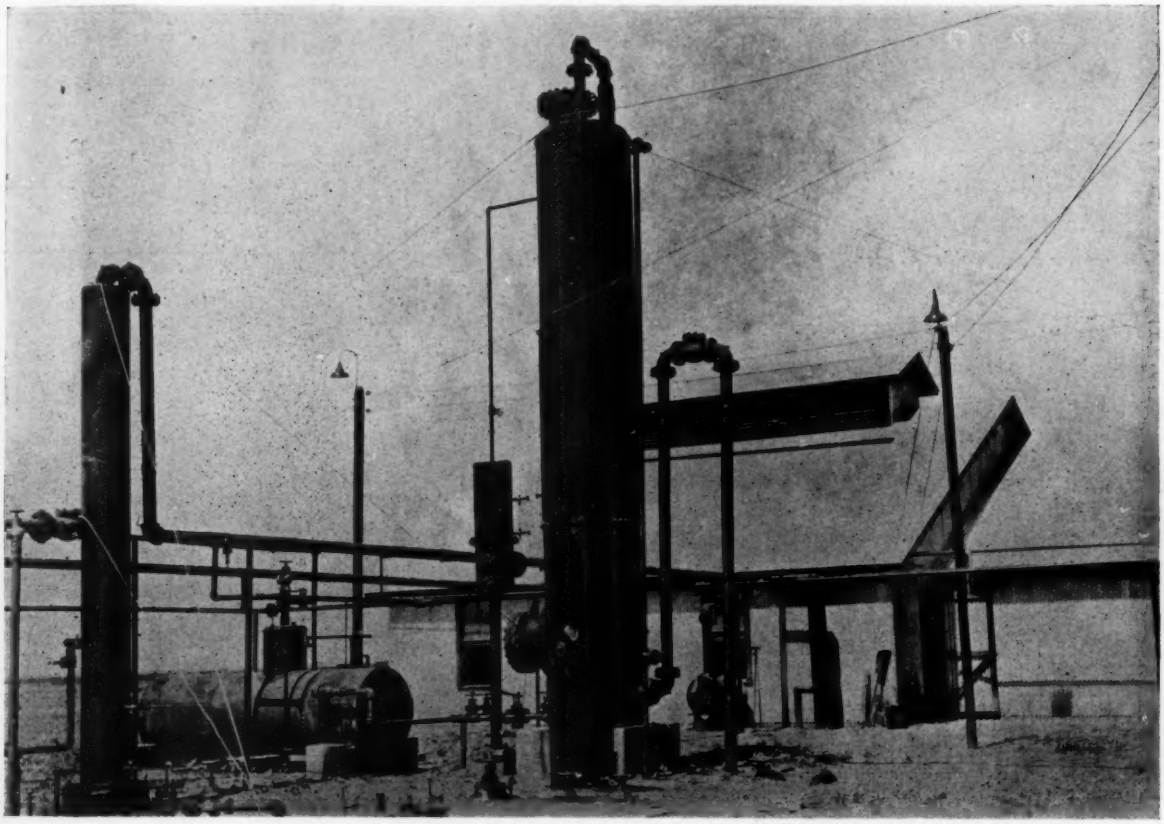
The Bureau of Mines, Department of Commerce, has purchased an American type 20-ton oil shale retort, known variously as the Dundas-Howes, or N-T-U retort, which will be erected immediately at the experimental oil shale plant of the bureau near Rulison, Colorado. The new retort will be erected alongside, and operated in parallel with, the bureau's Pumpherston retort of the Scottish type, which is now being heated in preparation for the beginning of experimental operation.

Laboratory eperimental work of the Bureau of Mines on oil shale, extending over a period of six years, has indicated two entirely different methods of producing refinable oils from oil shales. Both methods are fundamentally sound, so far as can be determined by laboratory investigation. In the first method, the shale is heated slowly and enough scavenging steam or gas passed through the distilling mass to prevent undue decomposition of the oil. This method results in a relatively low yield of crude oil of relatively high quality, and a relatively low yield of fixed gas of relatively high heating value. The crude oil so obtained can be sent to the refinery stills without further treatment.

In the second method the shale is heated rapidly, care being taken not to reach temperatures high enough to decompose the oil products, and a large excess of scavenging gas is passed through the distilling mass to remove distillation products as rapidly as they are formed. This method yields a maximum quantity of crude oil of relatively poor quality and a maximum volume of fixed gases of relatively low heating value. The crude oil so produced requires a preliminary coking distillation before going to the fractionating stills, but either method, properly operated, apparently will produce the same results in finished oil products.

Engineers of the Bureau of Mines, in making a selection of retorts for the experimental oil shale plant, took into consideration, first the desirability of having equipment which would carry out the two different methods of distillation; second, sufficient flexibility of control so that distillation tempera-

(Continued on page 30.)



Scrubber and oil absorber installed at California Company natural gasoline plant in Westbrook field, Texas.

California Company Puts Gasoline Back in the Crude

West Texas plant keeps yield high, giving no attention to specifications

By Rove Munsell
Staff Representative

THE California Company, sometimes spoken of as the company which uses California methods in the Mid-Continent, has put into operation on its properties in the Westbrook field, in Mitchell County, West Texas, a "California" natural gasoline plant.

The customary practice in the Mid-Continent fields, it is well known, is to ship the natural gasoline by tank cars or run it by pipe lines from the plants in the field to the refineries. There it is blended with the refinery products.

While this is also a rather common practice in California, a part of the natural gasoline, porbably as much as 25 per cent, is run back into the crude in the field. The admixture is then conveyed to the refineries where the natural gasoline is recovered along with the light fractions of the oil in the refining process when straight run gasoline is made.

This latter method of handling natural gasoline is the one employed by the California Company in the Westbrook field, in West Texas. As the gasoline is manufactured in the field it is pumped directly into a tank where it becomes mixed with the crude oil as the latter enters the pipe line which carries the company's production to the Col-Tex refinery at Colorado, Texas.

Conditions Favorable

There are several more or less special conditions obtaining in the Westbrook field which make the system very practical there. The gravity of the oil being produced, for instance, is low, being 26 degrees. The mixing of the natural gasoline directly with the oil in the field tends to facilitate the handling of the oil in pipe lines and storage.

By handling the natural gasoline under pressure, such as it is with this system, losses from evaporation are cut to a minimum. The natural gasoline is rather wild and the light constituents tend to weather away rapidly when handled at atmospheric pressure.

The gas from the Westbrook field is particularly high in sulphurous compounds. This is also true of the oil, and refined products require special treating for the necessary physical and chemical characteristics of a marketable product.

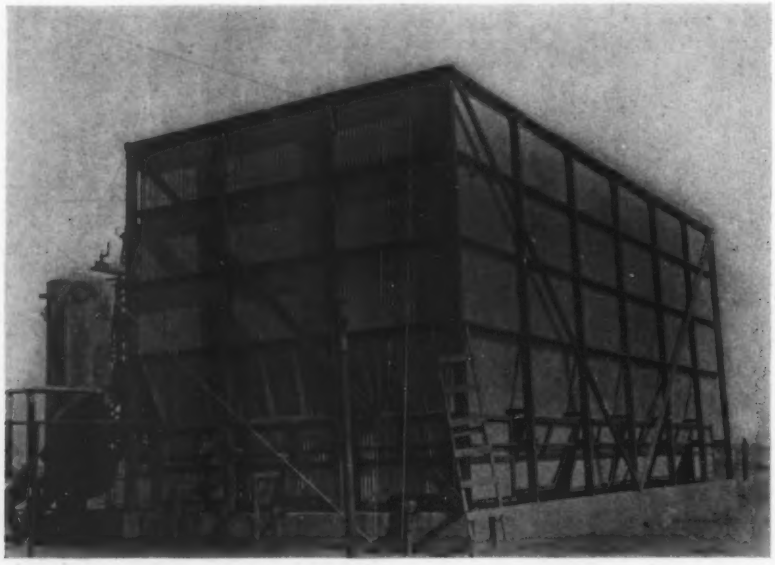
The system of rerunning the natural gasoline through the refinery along with the crude oil obviates in this case the necessity of treating it separately since the total products from the stills must be treated in any event.

The natural gasoline plant turns out around 2000 gallons daily from gas being run through the plant which tests about 3.75 gasoline content. It is planned to use the plant to recover vapors from field tanks, also. Special tops are now being installed on the tanks and when they are in place the vapors will be collected and run through the natural gasoline plant.

No Specifications

The highest possible yield is being sought with the plant without regard to such considerations as end points, colors, etc., of the products. Since the gasoline is not marketed *per se* this isn't necessary.

The natural gas going through the plant is first put through a compression cycle



Cooling tower designed to secure a definite draft effect. The transom like doors at the bottom are provided for control.

and then an oil cycle. The maximum pressure of the compression cycle is only 125 pounds. The first stage of compression booosts the gas to 50 pounds pressure and the second stage to 125 pounds pressure.

The first stage of compression, although housed in the plant compressor building, is really only a booster station for the gas from a few very low pressure wells. The gas from wells with pressures of 50 pounds or more goes directly to the second stage of compression along with the gas from the low stage compressor.

An eight by 10, gas engine driven single cylinder compressor is used to boost the low pressure gas to 50 pounds, and an eight by eight single cylinder compressor, also gas engine driven, brings the pressure up to 125 pounds.

The compressed gas after being cooled and put through an accumulator chamber is recycled through an oil chamber where it is further stripped.

The plant is exceedingly simple in operation and design. Only one man is necessary to keep things going at all times. The plant was constructed with the prospect of having something that would pay itself out in a comparatively short period of time. Costs in construction were kept to a low figure by using much stuff, such as pipe, fittings, pieces of machinery, etc., that the average operating company's properties will generally yield. Most of the equipment used is second-hand, and some of it was transferred from the company's properties in California.

An interesting feature of the plant is the cooling tower. It is so designed that a flue draft effect is secured on the air circulating through it.

The air circulates from the bottom up through the top with a pronounced draft. Doors are placed at the bottom and the top is left open. The doors are built on the order of transoms to control the draft under varying atmospheric conditions.

Extensive Shale Experiments Planned By Bureau

(Continued from page 28)

tures, distillation zones, gas velocities, etc., could be readily varied and controlled; and third, mechanical simplicity.

The Pumpherston retort, the result of over seventy years of practical experience in oil shale retorting in Scotland, exemplifies slow distillation, and the N-T-U retort, under development in large scale units for over three years in California, exemplifies rapid distillation. Both retorts are flexible in control, and both mechanically simple. The Pumpherston retort is apparently particularly suited for relatively low grade shales and the N-T-U retort will probably show to best advantage on richer shales. In the opinion of the engineers of the bureau the two retorts form an admirable combination of experimental equipment for the chief purposes of the retorting investigation, i. e., (1) to transpose to retorting units of commercial size the conditions determined by laboratory study most suitable for producing maximum amounts of refinable products; and (2) as large scale study directs, to modify these conditions so as to produce best results at lowest cost.

The experimental plant is complete, except for the erection of the N-T-U retort and its auxiliary equipment.

Construction to date has been carried on, and all equipment, including the N-T-U retort, has been purchased with the initial $90,000 appropriation made available March 3, 1925. An additional appropriation of $89,000 became available July 1 for plant operation during the fiscal year 1926-1927.

The plant consists of two retorts and their auxiliary equipment (condensers, scrubbers, exhausters, measuring instruments, piping, etc.); water supply system, which pumps water from a well near the Colorado River one and one-half miles to a storage tank at the plant; 70 H. P. boiler plant (2 35 H. P. boilers) equipped for coal or fuel oil firing, 5 K. W. turbo-generator set for plant lighting and laboratory power; 40 H. P. gas producer for starting and stand-by gas supply; three 25 barrel oil run and separating tanks; two 250 barrel storage tanks; one 25 barrel fuel oil tank; small pipe still with 25 barrel fat and lean oil tanks, condensers, cooling sections, etc., for recovering scrubber gasoline; machine shop and store room; control laboratory; quarters for plant employes; a 5600 foot aerial tramway for transporting shale from the mine to the plant, with necessary terminal machinery; oil shale crusher and storage bins and chutes.

A simple, but efficient, heat exchanger user by the California Company. The compressor building, cooling tower and steam still is shown in the background.

The Molbydate Method for Determining Lead in Doctor

"THE Earning Power of Research," is a paragraph heading which has become quite familiar to readers of technical and trade journals of recent years. Another phase of this subject might well be exploited under some such heading as "The Earning Power of Chemical Control." This ought to be especially attractive to chemists and executives of oil companies throughout the Mid-Continent where elaborate organization of technical staffs is not the rule, and where the job of the plant chemist is apt to involve everything from the flash cup to benzol equivalents, and from flue gas analysis to the efficiency of turbo-generators.

Chemical control involves as a primary consideration the development of a technique by which processes which are more or less generally used, may be quickly and accurately checked from the standpoint of the reactions involved. There is an abundance of such problems, which because of their basic nature, do not involve any secrecy of process, and which might as well be published in the bulletins of the A. S. T. M., or the Bureau of Mines, except that the **outside** public is not interested in them, and the **inside** public does not take the trouble to exchange ideas in an equivalent mannner.

The following method for determining lead in doctor is presented here because it is thought to be capable of improvement and the fellow chemist who improves it may be generous enough to let the rest of us in on it. It is not suggested as a substitute for such methods as that described in the May issue of The Refiner, but because it has an adaptation to percentages of lead too low to be accurately determined by the sedimentation method there described. The author's problem, determined by the sedimentation method for which the molybdate method has been adapted, is that of maintaining the lead in doctor at a percentage between .20 and .75% Pb in a caustic solution of about 15 deg. Be. gravity.

Method Known

The Ammonium Molybdate method for determining lead may be found in any text on quantitative analysis, being especially well treated by Schaeffer, White, and Calbeck, of the Eagle-Picher Lead Company, in a book entitled, "Chemical Analysis of Lead and Its Compounds," and obtainable from the company above mentioned. Fundamentally it involves the precipitation of dissolved lead as a sulphate, dissolving this with ammonium acetate, and titrating with standardized ammonium molybdate, using a solution of tannin as an outside indicator. To obviate further references, the method will be described in detail as used in this laboratory.

PROFITABLE TRADING

There is a worn axiom of each of two men having a dollar and exchanging, only to come out with just a dollar each, while two men, each with an idea, trade and then each has an idea.

That is just the point Mr. Catlin makes in this article.. He prefaces it with a plea for more liberal trading among chemists and technical men, as well as practical operators, in the refining and natural gasoline fields.

A publication can render no better service to its industry than to become the medium of such trading.

—The Editor.

Reagents:

Sodium sulphide, about 10% solution.
Nitric acid, about 15% solution.
Sulphuric acid, C. P.
Ammonius acetate, described later.
Ammonium molybdate, standardized solution.
Tannin solution, freshly prepared, about .1 gm. to 20 c.c. water.

Ammonium acetate is prepared as follows:

Ammonium hydroxide (concent.) 95 c.c.
Acetic acid (80%) .....125 c.c.
Water (distilled) .....100 c.c.

If glacial acetic acid is used instead of the 80% grade, use 125 c.c. water and 100 c.c. acid.

Ammonium molybdate is made up to contain 8.67 grams to one liter of water. For ordinary purposes this will be sufficient standardization, if good C. P. quality reagent is used. For greater accuracy it may be standardized against pure litharge or pure lead sulphate. One cubic centimeter of this solution is equal to 1.0% Pb on a one gram sample.

Sample

The amount of sample to be used for analysis is determined by the amount of lead present in the doctor, so that from about 10 c.c. to 25 c.c. of molybdate solution will be required to complete the titration. For routine work where the gravity of the doctor is fairly constant, the sample may be measured in a graduated cylinder or burette instead of weighing. The number of c.c. multiplied by the specific gravity being the weight of sample. In other words an amount of doctor is taken which will contain from .1 gm. to .25 gm. of lead.

Manipulation

If the doctor has been used for treating straight run distillates it may be possible to precipitate the lead as sulphate at once by the addition of sufficient sulphuric acid to completely precipitate it. Filter, wash the precipitate, and dissolve about 15 c.c. ammonium acetate, heating to effect complete solution, and titrate while hot. The ammonium molybdate is added about .5 c.c. at a time when near the end point, and the end is indicated when a drop of the sample added to a drop of the tannin solution gives a yellow color. A white spot plate is desirable, and a very convenient one is the bottom of an inverted evaporating dish. The number of c.c. of molybdate solution multiplied by .01 equals grams of lead in the sample. This is divided by the weight of the sample, times 100, equals the per cent lead.

If the doctor has been used on cracked distillates the direct precipitation of lead as a sulphate is usually complicated by the fact that tar acids are precipitated at the same time, and being of an oily nature, the lead sulphate becomes bound up with the oil drops, making solution in ammonium acetate extremely difficult. This same action prevents the use of precipitation tubes for lead sulphate measurement in samples containing sufficient lead for that method, and may cause trouble with any precipitation method where the caustic is first neutralized by acid. To avoid this difficulty the lead may be first precipitated as a sulphate, using soduim sulphide or hydrogen sulphide if convenient. An excess of the precipitant is added and the sample brought to boiling to cause complete settling of the lead sulphide. The precipitate may now be washed by decantation, pouring the wash water through a filter to collect any precipitate carried out by the washing. The tar acids are carried off with the filtrate.

Nitric acid is used to wash the filter free from lead, being first heated to boiling, and poured through the filter directly into the beaker containing the washed portion of the precipitate. It is not necessary to dissolve all the sulphide in nitric acid. Sulphuric acid is added, using 5 to 10 c. c. of C. P. acid, and then boiled till the nitric acid is completely expelled, as indicated by the appearance of dense white fumes of sulphuric acid. This operation is very important since a very small trace of nitric acid will give a yellow color on the spot plate with the tannin solution, thus obscuring the real end point. After cooling, add about 50 c. c. distilled water and allow a few minutes for settling of the sulphate precipitate. This may also be washed largely by decantation as before, finally washing the filter with about 15 c. c. of boiling ammonium acetate and collecting it in the beaker with the main precipitate. This is then heated again to boiling and more ammonium acetate added if necessary to effect complete solution of the lead sulphate. Titration is then carried on as previously described.

With a little practice the entire operation should be carried out in 20 or 30 minutes and with proper precautions a high degree of accuracy obtained.

Asphalt road through Kern County oil field. The wells produced the crude from which the asphalt was made.

Refinery Production of Asphalt Growing

Plants on both seaboards lead in output of this substance of varied uses

By Geoge Reid

ASPHALT, one of the products of crude oil, requiring special refining processes, offers an instance of a growing industry. In value, age and future possibilities its position is such that the refining industry should keep posted on its importance.

First, as to the value of the asphalt production—to give some representative figures relating to the rapid growth of an industry which, in spite of its age, must be termed young, for the intensive application and exploitation of asphaltum has been in actual progress of development only some thirty or forty years, while its most rapid strides, its actual arrival, has transpired within, probably, the last ten years. In the past decade, dating from 1915 to 1924 inclusive the asphalt industry has improved its record from production estimates in 1915 of 388,318 short tons of asphalt produced in the United States from Mexican petroleum, with a value of $3,730,436; and asphalt produced from domestic petroleum in 1915 of 664,503 short tons, with a value of $4,715,583; or a total production of petroleum asphalt alone in 1915 of 1,052,821 tons with a value of $8,446,019. These figures do not include the native varieties of asphalt produced.

In 1924 the combined asphalt production in the United States from both Mexican and Domestic petroleum was 3,079,371 short tons, having a value of $36,015,800. In other words, the production after ten years is practically three times as great and the value in dollars is four times that of 1915. Figures for 1924 indicate that native or natural asphalts sold at mines in that year was 562,367 short tons with a value of $3,958,339. Thus, at the close of 1924, the asphalt production and manufacture in the United States had assumed the proportions of a forty-million dollar industry, with every indication of growing and expanding steadily. Early figures for 1925 offer conclusive evidence that the industry is still expanding, production figures indicate an increase in asphalt production of approximately 4 per cent, or about 120,000 short tons over 1924.

Value Increasing

Table No. 1, which is based on government estimates shows the volume of asphalt put out by the refineries of the United States by district, by the month, and by each district for the year. This table is not inclusive of natural or native asphalts, of which 562,367 tons were produced in 1924, and which production shows an increase in 1925 over previous years.

The production of asphaltum from petroleum is classified as a separate phase of the industry, and though petroleum is the source of by far the greater amount of the finished product, still, the natural or native substances are of much interest, especially as they throw some light on the age and knowledge of the asphalts and their uses.

In the matter of age, for example, it is estimated by scientists that the bed of non-decaying, water impervious asphalt lying at Brea flats, in the city of Los Angeles, and from which bed the skeletons of many ancient animals (mastodons, etc.) were recovered, that this bed of live, adhesive and flexible substance is from 25,000 to 250,000 years old.

Throughout the world, beds of asphalt have been frequently discovered, surface beds mostly, though in certain instances asphalt is found well below the surface, from where it is usually mined in a manner similar to coal. One small mine of this type is in operation in the shallow asphalt field of Newport, California. Here, asphalt of fine quality is bedded about 300 feet below the surface.

Many Natural Beds

Such beds of natural asphaltum exist in many parts of the world, United States, Switzerland, France, Germany, Italy, Russia, Austria, Japan, Spain, Turkey, Roumania, Great Britain, Poland, United States of Columbia, Canada, Netherlands, Cuba, Mexico, Philippines, East Indies, three countries of South America, and Greece. Due to certain differences in physical and chemical characteristics these natural deposits are given numerous names, and the fact of the existence of varying quality and the many names leads to some confusion when speaking of native asphalts. Their successful utilization in industry is dependent upon their characteristics and much care and investigation is necessary in the buying and marketing of the various grades. Among these native asphalts the following are more or less familiarly known and utilized; Gilsonite, from Utah; Wurtzilite, sometimes called ellaterite, also from Utah; Ozokerite, Utah and Galicia; Albertite, from N. B., Canada; Grahamite, from West Virginia, California, Texas and Mexico; glance pitch ar manjak, from Mexico, West Indies, Trinidad, and others from various sources known as montan wax, nigrite, hatchettite, impsonite, brea, and asphalts named after the country or source, such as Bermedez, Cuban, Trinidad, and asphaltic limestones, etc. The foregoing indicates the general or widespread distribution of the substance throughout the entire world.

Much has been written as to asphalt utilization by the ancients; and although its exploitation has assumed the proportions and importance of a distinct asphalt industry only in the last half century, much detailed information is available as

to its rather limited use throughout the ages. For example, the ancient fountain of Is, located on a tributary of the River Euphrates, is said to be the source of asphalt supply of ancient Babylon and this so-called fountain is still yielding asphalt. Centuries later, the asphalt beds of Switzerland, Val de Tramers, was discovered and utilized by Eirinies, a Greek physician, in 1712, who recommended its use as a protective from water and elements to wood and structures of his time. Eirinies was aware of its use by the Babylonians and Egyptians (who used it in embalming) and he employed the substance for lining cisterns, and walls, for cementing material and for flooring warehouses, etc. This probably marks the earliest application of asphalt for commercial use in the later centuries.

Lake in Trinidad

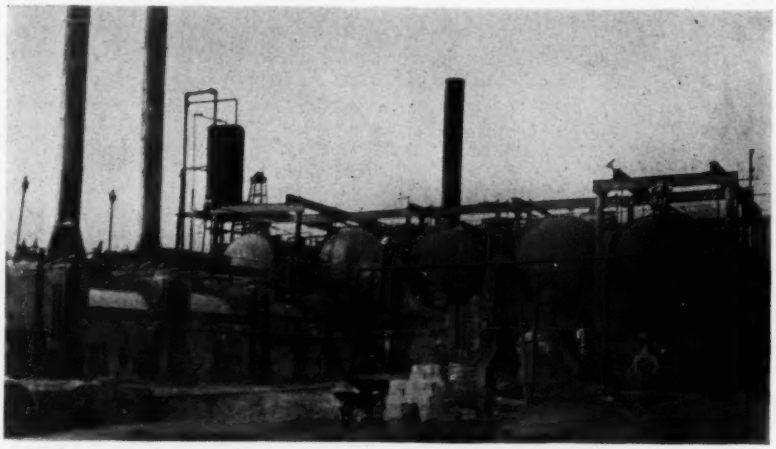
One of the most widely known deposits of natural asphalt is the Trinidad Lake in British West Indies possessions. This lake is estimated to be from 90 to 114 acres in area, about 135 feet deep at the center where the supply is replenished by a natural flow amounting to about 20,000 tons yearly. The lake is said to contain 6,000,000 tons of asphalt, and shipments from this area are reported as being 140,000 tons per year.

Another lake of importance is being exploited in the State of Bermudez, Venezuela, about 20 miles inland from the Gulf of Paria, which has an area of 1000 acres. It is the source of the type of asphalt known and named after the district—Bermudez.

In 1912 extensive asphalt deposits were discovered by a Forest Ranger in Tayte, Philippine Islands, which was later employed in paving the streets of Manila, and much of it was exported to the Orient.

Its Uses

Beginning with the earliest records of mankind asphalt has been listed as one of the unusual and valuable implements of the races. With the discovery in later years of the practical methods of producing it from crude petroleum by refining, the industry has grown rapidly. In 1902 only 20,826 short tons were manufactured from domestic petroleum and sold at the refineries. In 1910 this had increased to 161,187 tons. In 1918—604,723 tons, and in 1924 the volume had reached 1,158,456 tons, derived from domestic oil only; while from Mexican petroleum the refineries sold 1,920,915 tons in 1924.



Shell stills running asphalt, batch method, Gilmore Oil Company, Hollywood, California.

Table No. 2 shows the production and sale of petroleum asphalt by years from 1902, up to and including 1924.

Refinery Production

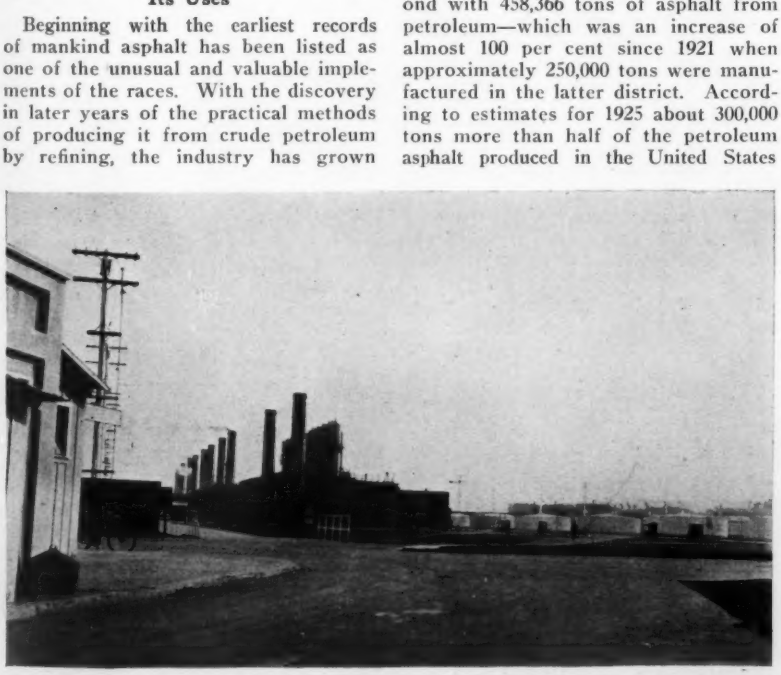
The rapid growth of the industry is reflected in the development of large refining installations for the manufacture of asphalt. The district which has the largest capacity for producing asphalt is termed the East Coast—where in 1925 the production at refineries was 1,203,083 tons. California ranked second with 458,366 tons of asphalt from petroleum—which was an increase of almost 100 per cent since 1921 when approximately 250,000 tons were manufactured in the latter district. According to estimates for 1925 about 300,000 tons more than half of the petroleum asphalt produced in the United States was manufactured in the East Coast and California districts.

The manufactured petroleum asphalt in the United States is produced at the refineries of the petroleum industry. Essentially the process is one of reduction, or topping. In the more fluid oils, the water and foreign impurities are removed by sedimentation or gravity separation, following by distillation or vaporization of the lighter vapors, reducing the residua to the proper consistency—which is governed by the intended use. Consistency is spoken of in terms of the penetration test, and the results of this test govern the utility of the asphalt. Usually, in petroleum refining, processes are governed by check tests performed with instruments designed for the specific purpose, but the asphalt reduction process is entire-

Table 2.
Asphalt Manufactured and Sold at Refineries Over a Period of Years

Year—	From Domestic Petroleum Short Tons	From Mexican Petroleum
1902	20,826	.....
1903	46,187	.....
1904	44,405	.....
1905	52,369	.....
1906	64,997	.....
1907	137,948	.....
1908	119,817	.....
1909	129,594	.....
1910	161,187	.....
1911	277,192	.....
1912	354,344	.....
1913	436,586	114,437
1914	360,683	313,787
1915	664,503	388,318
1916	688,334	572,387
1917	701,809	645,613
1918	604,723	597,697
1919	614,692	674,876
1920	700,496	1,045,779
1921	624,220	908,093
1922	805,145	1,242,163
1923	995,654	1,378,722
1924	1,158,456	1,920,915

1924—total tons of Asphalt sold at refineries was 3,079,371, or at the rate of 256,614.25 tons monthly for the year.



Asphalt refinery of the Standard Oil Company of California at El Segundo.

ly governed by the feel of the asphalt to the stillman's teeth. The consistency is actually determined by chewing—and later the laboratorian checks the stillman with his penetrometer. This practice is necessary because the asphalt must be removed immediately to avoid further reduction, when it has arrived at the proper or required consistency. In heavy asphalt oils the usual impurities consist mostly of salt water, which water is replete with dissolved mineral matter, and a great proportion of this water is emulsified with the oil. Various types of apparatus are employed for breaking down this emulsion with such agents as heat, steam and chemicals — after which treatment the oil is subjected to the usual distillation or vaporization procedure. Difficulty of this kind is especially encountered when working with the very heavy oils.

Operating Methods

The refining methods consist of batch and continuous operation. The latter is applicable only to steam refined asphalt. In the batch operation, both steam refining and air blowing are practiced, and often a combination of the two methods. Direct fire is employed in both methods until the desired temperature required for steam or air blowing treatment is reached. The oils of the semi-paraffin type are usually subjected to the air blowing system, which produces, because of the subsequent chemical action, more asphalt in the still than was actually charged to it. The resultant product, however, usually has less ductility than the steam refined product. It is estimated that about 300 cubic feet of air per barrel of oil, per hour, is required in the air blowing method. The asphalt thus produced, though not especially desirable for paving purposes, has its special uses, which will be discussed at some later writing.

According to late figures there were 30 organizations in the United States, in ten different states, that were producing asphaltic material from crude petroleum. In ten states there were 18 companies that were producing commercially, asphalts and related bitumens from the natural or native asphalts in this country. In all, 48 organizations, operating in 16 states were producing the great quantity of asphalt as shown in the two accompanying tables—constituting the manufacturing points of the $40,000,000 industry which has rapidly developed in the last few years into a distinct and important department or phase of the petroleum industry.

While the average man motoring through the country, thinks of asphalt as excellent road surfacing material only, there are numerous other important, interesting, and some perhaps unique, methods of employing and exploiting the many types of asphalt, and this, among other things, will be discussed at a later writing.

Table 1—Asphalt Refinery Output by the Month and District During 1925 in Tons.

District—	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
East Coast	50,194	41,986	69,477	101,117	135,681	121,525	117,759	124,793	126,303	137,986	116,527	59,736	1,203,083
Pennsylvania	123	.....	63	.....	.....	.....	.....	.....	.....	.....	.....	.....	186
Indiana and Illinois	9,274	17,149	18,859	16,655	17,583	17,176	15,698	15,397	15,103	15,020	14,921	14,430	186,265
Oklahoma and Kansas	13	12	13	12	345	286	.....	.....	.....	91	110,527	.....	111,299
Texas	26,687	20,306	23,901	29,397	33,311	41,958	36,777	44,628	33,014	30,108	27,044	24,592	371,723
Louisiana and Arkansas	25,369	17,803	23,520	25,505	37,072	35,203	38,324	44,628	41,233	45,912	36,123	25,180	395,872
Colorado and Wyoming	899	1,136	1,412	1,207	4,481	4,807	5,946	3,210	41,233	3,112	1,920	1,511	70,874
California	32,578	24,991	31,395	28,128	32,470	42,069	55,199	56,236	45,169	52,172	27,846	30,113	458,366
Total	145,137	123,383	167,640	202,021	260,943	263,023	269,703	288,892	302,055	284,401	334,908	155,562	2,797,668

National Petroleum Association Program Announced

Washington, D. C.—One of the most interesting programs in the history of the organization is promised for the fall meeting of the National Petroleum Association at Atlantic City, September 15, 16 and 17. The program has just been issued from the office of Fayette B. Dow, counsel of the association here.

Indications are that the sessions will draw a large attendance. Last fall the association held its meeting at Atlantic City with success.

Kermit Roosevelt will be the principal speaker at the annual banquet. He is to relate some of the experiences of himself and his brother, Theodore Roosevellt, in Central Asia. Moving pictures will illustrate this talk.

The program follows:

"Products and By Products of Association Work," by O. P. Keeney, Tide Water Oil Co., president of the National Petroleum Association.

"The National Petroleum Association Twenty Years Ago and Today," by Judge C. D. Chamberlin, secretary of the association, Cleveland.

"Research and Development Work as Applied to the Oil Industry," by Frank A. Howard, president Standard Development Co. (Standard Oil Co. of New Jersey) New York.

"What the Fire Marshals Are Doing," by R. A. Wotowich, Cities Service Co.

"The Fire Alarm Rings," by Harry R. Lewis, Conewango Refining Co., Warren, Pa.

"A Year of Progress," by Fayette B. Dow.

"The Association's Adventure in Cooperative Engineering," by B. B. Stroud, McKean County Refining Co., Bradford, Pa., and director in charge of the association's department of manufacture.

"What I Have Learned from a Study of Twenty Boiler Houses," by Herbert A. Ross, mechanical engineer, of H. S. Bell's organization.

"Relation of Cost Accounting to Manufacture," by P. S. Tarbox, Independent Refining Co., Oil City, Pa.

"Reducing the Cost of Manufacture," by Jacob France, president Mid-Continent Petroleum Corp., Tulsa.

"Modern Stills," by H. S. Bell, New York, refinery engineer in charge of co-operative engineering program of the Pennsylvania refiners.

"Better Trade Relations," by E. M. Lyons, Tiona Petroleum Co., Clarendon, Pa.

"Marketing Problems and Practices," by speaker to be announced.

"A Traffic Department That Functions," by Frank B. Fretter, president the National Refining Co., Cleveland.

"The Interstate Commerce Commission's Order for a General Investigation in Rates on Petroleum in Central Trunk Line and New England Territories," by Willis Crane, National Petroleum Association, Washington.

"Avoidable Misunderstandings in Oil Tests," by Fred G. Clark, president Fred G. Clark Co. and director in charge of association's department of standards and tests.

"Discriminatory Legislation Against the Oil Industry," by Sheldon Clark, Sinclair Refining Co., Chicago.

S. F. Murphy, Jr., well known among industrial plants on the Pacific Coast and in the Orient, has joined the service department of the Quigley Furnace Specialties Co., Inc., manufacturers of Hytempite, Acid-Proof Cement, Quigley Refractory Gun, Triple-A Solutions, etc. Making his headquarters at San Francisco, Mr. Murphy will cover the entire west coast, California, Colorado, Texas, Utah, Oregon, Washington, Wyoming, British Columbia and the Orient.

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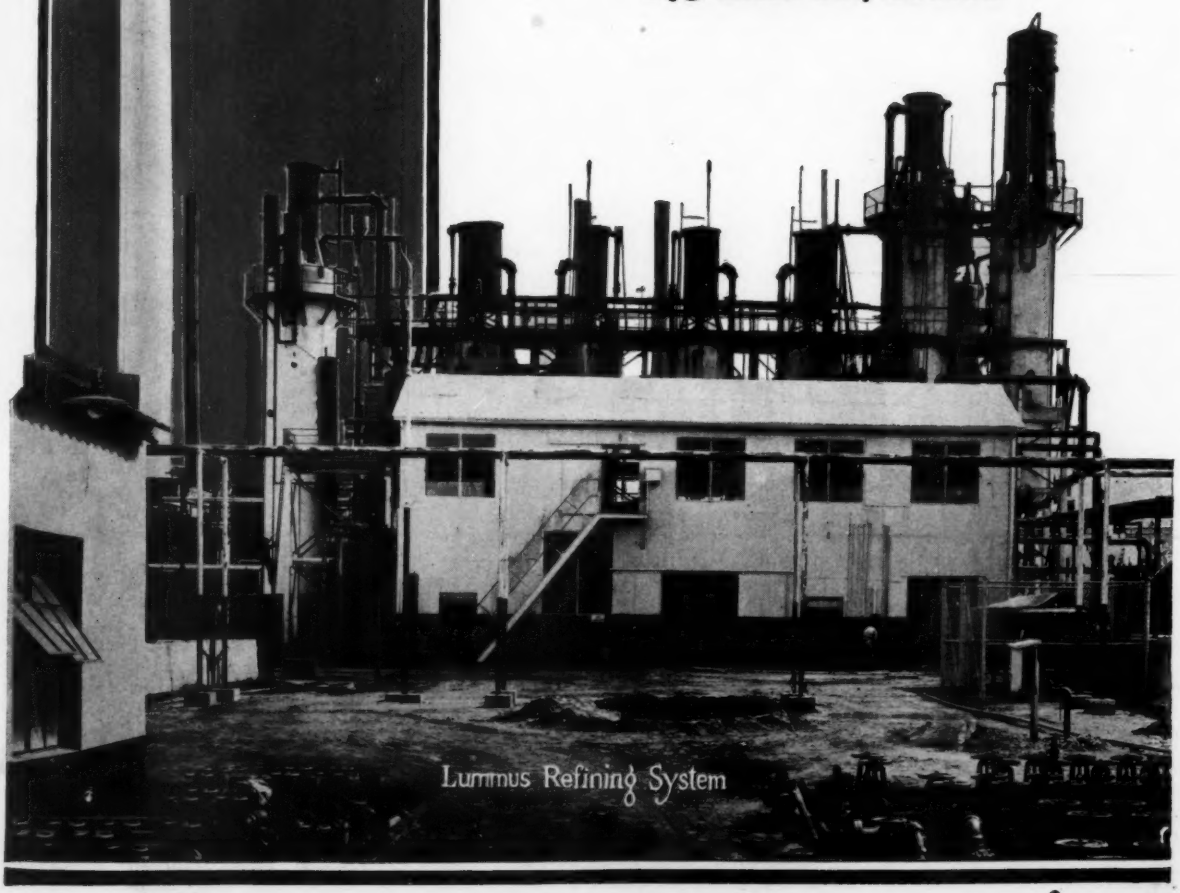

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Refiners' Problems in Making Stoddard Cleaning Solvent

By H. L. Kauffman,

Consulting Petroleum Chemist, 610 Midland Savings Building, Denver, Colorado

NEARLY a year ago, a new dry-cleaning solvent known as "Stoddard Solvent" (named after W. J. Stoddard of Atlanta, Georgia, President of the National Association of Dyers and Cleaners, whose personal interest and activity in the matter caused the solvent to be named after him, was adopted as the standard solvent for cleaning purposes to be used by members of the Cleaners' Association in conducting their work.

As the specifications (which are given later) for this petroleum solvent are such as to be very difficult for the average refiner to meet, and, at the same time, to have a margin of profit on the sale of the product, the writer will mention and discuss herein the results of laboratory experimental work that was recently conducted by him in reaching conclusions as to the feasibility of making this product at one particular refinery.

Furthermore, in addition to the specifications for Stoddard Solvent, and the reasons given by the Cleaners' Association for the necessity of each specification, to be given in this article, mention will also be made of the requirements of a dry-cleaning solvent and the names of other cleaning solvents that have been used at different times, as well as the reason for desiring a petroleum solvent.

General Description of Dry-Cleaning Process*

Lloyd E. Jackson, (J. Ind. & Eng. Chem., 18 3, 237 (1926)), describes in a few sentences, essential features of dry-cleaning, as follows:

"The dry-cleaning process consists in washing wearing apparel, house furnishings, etc., which are made of textile fabrics, fur, or feathers, by means of such solvents as petroleum naphtha and specially prepared soap. Properly dry-cleaned materials are odorless, free from dirt, and unchanged in shape and color. The term 'dry' is used in contradistinction to 'wet' in the sense of wet with water. The dry-cleaning process is carried out in much the same manner as the washing of tetile fabrics with water and laundry soap, except that so-called 'dry' solvents, such as petroleum naphtha, are used instead of water. For economic reasons, dry-cleaning solvent must be regenerated in the dry-cleaning plant, and used over and over again. The loss entailed by evaporation, leaks, etc., is made up with fresh solvent."

*For a detailed description of the process, see Sci. Am., 127, 396 (1922); J. Home Econ., 16, 673 (1924).

Requirements

Mr. Jackson, as a Senior Industrial Fellow at Mellon Institute of Industrial Research, Pittsburgh, Pennsylvania, spent several years in a broad study of materials that carried possibilities as dry-cleaning solvents, and, as a result of this study, gained much knowledge as to the requirements of a desirable dry-cleaning solvent. Concerning such requirements, Mr. Jackson has the following to say:

"A desirable dry-cleaning solvent is one that is readily available at a low cost in all parts of the country. Efficient dry-cleaning does not require a liquid of supersolvent power for all kinds of materials. The dry-cleaning process depends on colloidal phenomena as well as on the solvent power of the liquid used. The fallacy that supersolvent power is needed has led occasionally to the employment of liquids that remove too much oil, and even dyestuffs, from the materials cleaned. The evaporation loss must be low, because (1) most solvents for dry-cleaning are inflammable and the fire hazard is directly in proportion to the volatility, (2) as a rule the breathing of the vapors is not healthful for the operators in the plants, and (3) it is not economical to have to replace large losses due to evaporation. Although the evaporation loss must be low, the solvent must be so volatile that it can be evaporated readily from all materials cleaned. A satisfactory solvent must be free from impurities that will develop odor or color. It must be one that can be economically purified for re-use in the plant."

A number of different solvents have been used (and, in many cases, are still being used) in cleaning fabrics. As any effort of the writer to discuss in his own words the different solvents that have been used would be only a repetition of the thought expressed so adequately by Mr. Jackson in his article [J. Ind. and Eng. Chem., 18, 3, 237 (1926)], therefore Mr. Jackson's comments concerning the different types of solvents, and the advantages and disadvantages of the use of each, are quoted in full below.

"Motor gasoline will clean fabrics, but properties which are essential for a motor fuel make it uneconomical for cleaning purposes. The light fractions are necessary to facilitate the starting of a motor, but when present in a cleaning solvent these mean loss, because they evaporate the first time it is used. The higher-boiling fractions of motor gasoline are objectionable, because that part is difficult to remove from fabrics and therefore gives a malodor. Unsaturated hydrocarbons are not objectionable when present in limited quantities in motor fuel, but are troublesome in cleaning solvent because they impart foreign odor.

"Natural gasoline has been and still is used to a limited extent for dry-cleaning. It has the advantage of drying readily, but it is so volatile that the evaporation in handling is excessive. Also, so much vapor escapes into the cleaning room that a great fire hazard exists, and the atmosphere is unhealthy for the cleaning operators.

"Carbon tetrachloride and petroleum-naphtha mixtures have been proposed to reduce fire hazard. The difficulty has been the relatively high evaporation loss and consequently the expensiveness of making up the carbon tetrachloride evaporated. These special mixtures also possess corrosive and anesthetic properties.

Too Efficient

"Benzine and other coal distillates are employed to some extent, although not so much as they were several years ago. As odd as it may seem, one of the outstanding disadvantages of these products is that they are too efficient as solvents. They remove all the oil and grease from the materials cleaned and leave them lifeless. Furthermore, the evaporation loss and consequently the cost, fire hazard, and toxicity to workmen are too great to make them of desired utility.

"Petroleum spirits has been purchased under such names as V. M. and P. naphtha, mineral turpentine, etc., for use by dry-cleaners. Some petroleum spirits have given satisfaction, but often the end point is too high or the percentage of unsaturated hydrocarbons is too great, or they are not sufficiently refined to produce a satisfactory dry-cleaning solvent.

"Most of the special dry-cleaner's petroleum naphthas on the market have been well-refined, fairly close boiling range, straight-run naphthas. The boiling range has been too low, however, to make them efficient as dry-cleaning solvents. The advantage of low evaporation loss and decreased fire hazard, which are essential for an efficacious dry-cleaner's naphtha, have been sacrificed for quick drying of the naphtha from the garments cleaned."

The specifications adopted by the National Association of Dyers and Cleaners for the petroleum product

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The fuel used in the alabaster lamps of Ramses was oil . . . petroleum . . . gathered from oil springs, bogs, marshes and river beds.

Thus, even in the time of the ancients, petroleum played its important part in the civilization of mankind, just as today it is one of the vital elements of everyday life.

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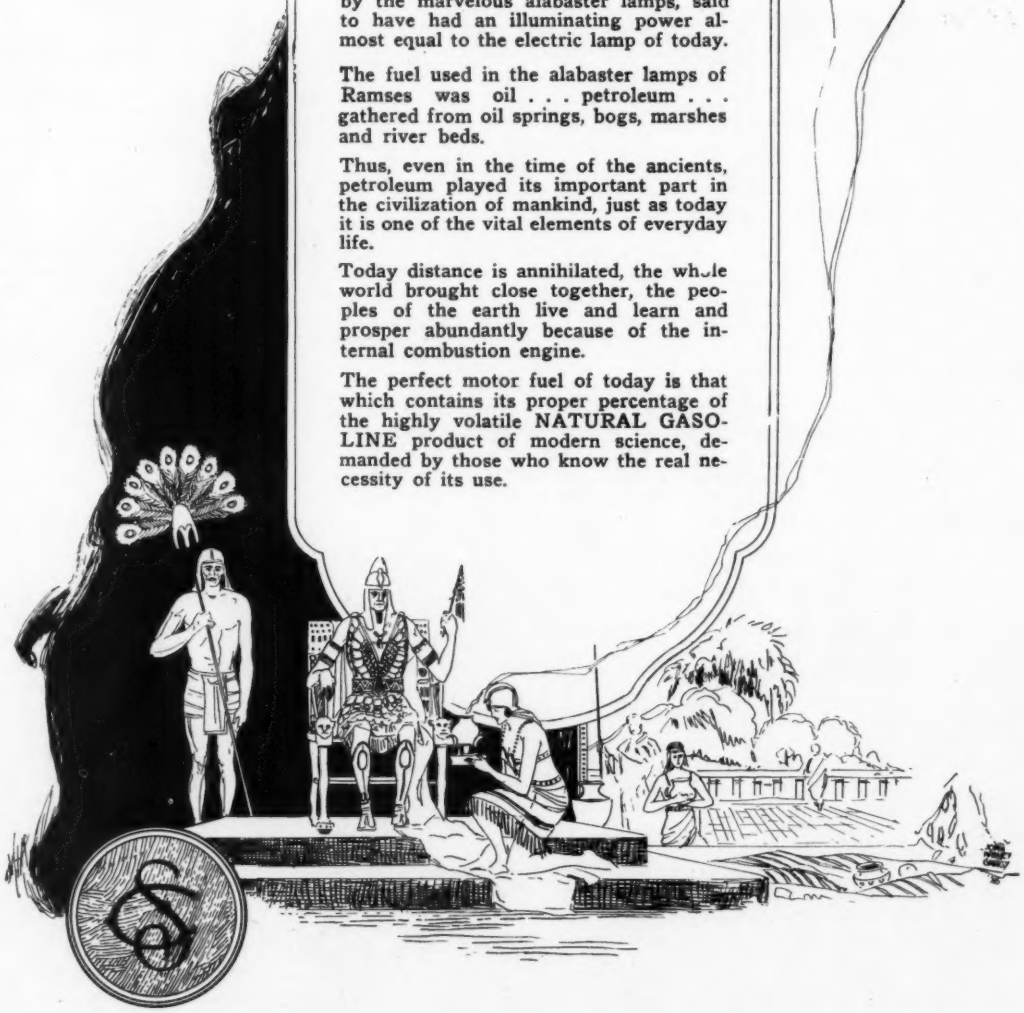

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known as Stoddard Solvent are as follows:

1. The solvent shall be free from undissolved water and suspended matter.

2. Color: The color shall be water-white.

3. Doctor Test: The doctor test shall be negative.

4. Unsaturated Hydrocarbons: Not more than two per cent of the naphtha shall be soluble in concentrated sulphuric acid.

5. Distillation Range: The temperature limits for the distillation are as follows:

The initial boiling point shall not be less than 300 degrees F.

The dry or end point shall be a temperature not greater than 400 to 410 degrees F.

6. Acidity: The residue remaining in the flask after the distillation is completed shall not show an acid reaction.

7. Aromatic Hydrocarbons: The naphtha shall not contain aromatic hydrocarbons, such as benzine, toluene and others.

8. The odor shall be sweet.

9. Flash point shall not be below 105 degrees F.

The tests mentioned in the above specifications shall be made and interpreted in accordance with Bulletin No. 5, Report of Committee on Standardization of Petroleum Specifications, published by the U. S. Bureau of Mines.

Reasons for Specifications

Briefly, the reasons given by the Cleaners' Association for demanding a petroleum solvent that will meet the specifications shown above are as follows:

1. The naphtha must be free from water and dirt, because, as the name "dry-cleaning" implies, the cleaning process must be dry and clean.

2. The color must be water-white, because the naphtha is used to clean white garments. Colored naphtha imparts some color to white materials.

3. The doctor test must be negative, because it has been observed that naphtha that is "sour" to the doctor test becomes colored, either in use or in storage, more readily than naphtha that is "sweet" to the doctor test.

4. The per cent of unsaturated hydrocarbons present in the cleaning solvent must be low, because they impart a foreign, disagreeable odor to the naphtha and to materials cleaned with it.

5. Concerning the distillation range, which calls for an initial boiling point of not less than 300 degrees F., and an end point of from 400 degrees to 410 degrees F., the Cleaners' Association comments in substance, as follows:

"For years dry cleaners have cleaned clothes with motor car gasoline, and the light vapors—so necessary in a motor car fuel but unnecessary in a cleaning solvent—have caused disastrous fires and explosions and, in many cases, loss of human life. The light ends in a motor car fuel are not only unnecessary when such petroleum product is used as a cleaning fluid, but, furthermore, they are thoroughly undesirable. Cleaners who will use a cleaning naphtha of from 400 to 410 degrees F. end point will be saved a great deal of trouble and expense. Clothes that have been dry-cleaned must be dried and aerated in dry rooms or drying tumblers. If standard motor car fuel is used as a cleaning solvent, the heavy ends contained therein cause odors to remain in the garments for a considerable period of time, and the garments, therefore, must be left in the dry rooms or drying tumblers longer than would have been necessary had the heavy ends been eliminated from the solvent."

The above statements are, in substance, those given by the Cleaners' Association as to the reasons for the need of a cleaning solvent of not under 300 degrees F. initial boiling point and not over from 400 to 410 degrees F. end point.

Lloyd E. Jackson, when doing research work on cleaning solvents, as a Senior Industrial Fellow at Mellon Institute of Industrial Research, for the Mundatechnical Society of America, recommended to the society distillation specifications, which were later adopted, calling for an initial boiling point of not under 280 degrees F. and an end point of not over 400 degrees F.

Distillation Range

Concerning this distillation range specification, Mr. Jackson has the following to say: [J. End. and Eng. Chem., 18, 3, 238 (1926)]:

"Petroleum naphtha described by these specifications has the property of low evaporation loss, with decreased fire hazard, etc., together with the property of relatively rapid drying time. Almost all dry-cleaning plants can use successfully naphtha of this description without encountering the drying problem of materials that are cleaned with it. No fires caused by static electricity have been reported in plants of members of the Mundatechnical Society after they started to use this particular naphtha, whereas a number of fires occurred in the plants when motor gasoline was employed.***

"The distillation range of 280 to 400 degrees F. produces a balance between the advantages of low evaporation loss and the disadvantage of long drying time. Almost every cleaning plant can readily evaporate a naphtha of this boiling range from materials cleansed. If the initial boiling point or end point is materially raised, difficulty will be encountered in many dry-cleaning plants in evaporating the naphtha from the garments."

From the above it is seen that there is a difference, in the initial boiling point specification, of 20 degrees F. between the specifications for Stoddard Solvent and those adopted by the Mundatechnical Society of America—the former calling for cleaning solvent that is 20 degrees F. higher in initial boiling point than is called for in the latter's specifications. As a result, the difficulties encountered by the petroleum refiner in making an approved cleaning solvent are even greater than heretofore.

6. The acidity test must be negative, because acidity may indicate the incomplete removal of sulphuric acid that is used in the refining process. Traces of sulphuric acid readily destroy textile fabrics.

7. The naphtha must not contain aromatic hydrocarbons, because these compounds—if present in considerable quantity—cause troublesome emulsions.

8. The odor must be sweet, because malodorous naphtha is difficult to expel from materials cleaned.

9. Concerning the specification that the flash point must not be below 105 degrees F., the Cleaners' Association states that a cleaning solvent having a boiling range of 300 to 400-410 degrees F. will be a product having a flash point of approximately 105 degrees F. on the Tag-A. S. T. M. closed cup type of tester, and give as a reason for having such a flash specification that thereby there is obtained a material lessening of the fire explosion hazard in using a cleaning solvent.

Flash Point

Jackson, on the other hand, has the following to say [J. Ind. and Eng. Chem., 18, 3, 238 (1926)] concerning the flash point of a cleaning naphtha:

"Stoddard solvent presents a problem to petroleum refiners because it is quite difficult—if not impossible—to make a naphtha with a flash point of 105 degrees F. that has the distillation range specified. In order to obtain the flash point specified, the initial boiling point must be raised to the neighborhood of 325 degrees F. or above. This means that there results a naphtha with considerably less than 100 degrees F. boiling range. The problem is complicated further by the fact that many dry-cleaning establishments, with their present type of drying equipment, can not remove naphtha of this boiling range from the materials cleaned. Consequently, the use of the naphtha will be limited to the few plants that can successfully evaporate it. * * *

" * * * The distillation range of 280 to 400 degrees F. (which Mr. Jackson recommended to the Mundatenchnical Society of America as being a suitable distillation specification for a cleaning solvent) gives a flash point that will be somewhat below 100 degrees F., but will be sufficiently high that there will be little danger of fire from static electrical discharges in cleaning rooms operated in the ordinary manner."

The writer's personal observations concerning the relationship between distillation range and flash point of

(Continued on page 76.)

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DEALING IN PERSONALITIES

ROBERT E. BERING, president of the California Gasoline Company, presents a striking example of what the "young blood" of the California gasoline industry is doing for the industry.

Mr. Bering, head of a concern which enjoyed the reputation of being the second largest independent producer of gasoline in the state until its consolidation with the California Petroleum Corporation in February, probably is the most prominent gasoline manufacturer under thirty years of age on the West Coast. He was born in Houston, Texas, on August 28, 1896, and soon moved to San Francisco, where he received an education in the public schools which culminated in his taking a B. S. degree in the University of California in 1917.

After leaving the university, Mr. Bering farmed for about six months, and was then associated with Minor Chipman, efficiency expert, for another six months. Shortly after discharge from the Naval Air Service at the close of the war, he was employed in the geological department of the Amalgamated Oil Company, where he remained for a year prior to entering the leasing game as an individual. In 1920 he formed the successful San Martinez Oil Company, and in February of 1922, the Signal Gasoline Company, which has $450,000 stock outstanding and an average earning capacity of over $30,000 per month.

Later in 1922 Mr. Bering organized the California Gasoline Company, and in 1923 the South West Gasoline Company, both of which were merged into the California Gasoline Corporation in May, 1923. This organization is capitalized at $2,500,000 with $1,036,520 outstanding, owns five plants operating at Signal Hill and Athens fields, holds the second rank among gasoline producers in the state with a daily average output of 65,000 gallons. Early in 1926, these properties were sold to the California Petroleum Corporation for about $3,000,000. Mr. Bering will become head of a new company being organized to consolidate plants of the California Petroleum Corporation and the California Gasoline Company which will have a total output of 115,000 gallons of gasoline daily.

ROBERT E. BERING
President California Gasoline Company

A. E. Landsittle has resigned as sales manager of the Globe Oil & Refining Company to become associated with the Randolph Petroleum Company.

When Alan E. Morphy of Los Angeles, formerly vice-president and treasurer of the Pacific Gasoline Company, left that oragnization recently, both employees and officials of the company manifested a sincere regret.

Mr. Morphy, who resigned of his own accord, was one of the best known and most highly esteemed men in the Pacific coast branch of the industry. He came to the Pacific Gasoline Company as secretary and treasurer in 1922, subsequent to 15 years of service with the Southern California Edison Company.

Alan Morphy was born and reared in Eastern Canada. At the age of seventeen he went to New York City where he sesition he held for several years, later cured a position with a bank, which pogoing to Pittsburgh where he was employed by another bank.

A short time later the family moved to California.

Mr. Morphy is a bachelor and a member of the California Club. He is a devotee of tennis and swimming and is a member of the "Wildcats", the pep organization of the Chamber of Mines and Oil.

The personnel of the Pacific Gasoline Company is pleased to know that Mr. Morphy will continue his contact with them as an officer of the Solano Company, in which a large number of Pacific Gasoline Company employees own stock and his occasional attendance at company social affairs.

Back in 1917-18, Mr. Murphy "did his bit" as an officer in the U. S. Army. Upon his departure from his last assignment, in Oklahoma, after the signing of the Armistice, one of his men wrote the accompanying poem, which well describes the man and his wonderful faculty for making friends:

When He Goes Back Home

He's the man from California,
And he ain't been long in town;
He's straight as any Injun
And pretty nigh as brown;
His eyes are bright and genial,
And his heart seems light as foam,
And we're all a-goin' to miss him
When he goes back home.

It's true he's no curled darling—
Just a rough and ready guy,
The brogue of Erin on his tongue,
But we're writin this to tell him
That, wherever he may roam,
We're all a-goin' to miss him
When he goes back home.

There's not a man amongst us,
Nor a woman, I dare say,
But has felt his genial humor
While an irksome hour away;
So, three rousing cheers to speed him—
Let them ring from cap to dome;
Old Central's going to miss him
When he goes back home.

His voice is like a foghorn,
His commands are heard a mile,
But "Morphy's Men" will tell you
There's "Hail Fellow" in his smile,
And they asked me when I wrote this
Please to end my little "pome"
With "Morphy's Men will miss him
When he goes back home."

El Dorado, Kansas.—Contract has been signed by the Skelly Oil Company for the addition of three Jenkins Cracking stills to the refinery here. The work will require about six months for completion. One additional boiler will be set.

We sincerely believe the Alcorn Radiant Heat Furnace, using Carborundum Boxes, makes possible the application of correct scientific principles in heating of oil, and constitutes the greatest advance ever made in this fundamental operation.

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Methods of Determining the Specific Gravity of Natural Gas

By Guy S. Mitchell

Specific gravity is a quality universally sought when consideration is given this product.

The specific gravity bears such a relation to other qualities that it may be termed a universal indicator of the content of the gas.

For these reasons, methods of determining the specific gravity of gas are a sort of pass key into the study of natural gas. The author of the accompanying paper has devoted time and experiments to collecting the data presented. The discussion started in the August issue and is concluded herewith.

—The Editor.

THE variation in water head was determined using orifice XVI on the 45 cc bulb. In the results that were obtained there was no noticeable variation due to differences of 14 to 19 cm. water head at the start and 1 to 5 cm. at the finish. This agrees with Edwards in his Bureau of Standards work in which he states that a low effusion pressure is to be avoided but that higher pressure does not always give any better results. It therefore seemed advisable to use a maximum pressure of about one to two inches at the finish.

Variation Due to the Size of Orifice:—The 45 cc. effusion tube was the most suitable size tube to use for the work. The gravity of the Lawrence City gas and of the commercial oxygen was determined using this size of effusion bulb, with different sizes of orifices. The error in stop watch readings is given in Table IV and is the highest variation of any one of the readings from the average reading.

The percentage error is calculated on the apparent gravities, or .580 for the gas and 1.105 for the oxygen. It will be noticed in the above table that most of the stop-watch readings checked within reasonable limits. With orifice XVII the readings on air and gas, and with orifice XVI the readings on air, checked for the first two or three runs and then the time increased and the runs checked again. The readings for gas on one of the runs with XVII seemed to rise slowly. They were as follows:—76.0, 76.0, 76.6, 76.8, 76.8, 77.0 and 77.0 seconds. This rise can no doubt be explained by the condensation of water vapor. The gravity of the natural gas as determined by use of the smaller orifices, .08 and .12 was more nearly like the true gravity of the gas but it should check with the gravity of the gas saturated with water vapor which is given above. Orifice IV gave good results in the determinations. It was also used to quite a large extent for taking gravities and always proved satisfactory. In work done by the Bureau of Standards[4], an orifice of .25 mm. in diameter is stated to give the best results. The design of apparatus, however, was somewhat different from that used in this work. In all the experiments orifice IV, which had a diameter of .21 mm. gave the most satisfactory results.

The Effect of Burrs

To determine what effect burrs and irregularties in the shape of the orifice had on the apparent gravity, eight orifices were made with varying degrees of roughness. They were all made with about the same size opening so as to obtain as near as possible the same accuracy

TABLE IV

ORIFICE		PER CENT ERROR IN READINGS				GRAVITY			
NUMBER	DIAM. mm.	AIR	GAS	AIR	O_2	GAS	% ERROR	O_2	% ERROR
VI	.08	.3	.3	.2	.1	.570	- 1.7	1.066	-3.4
V	.12	.2	.3	.3	.2	.569	- 1.9	1.112	+.6
XVII	.15	.8	1.0	.7	.3	.592	+2.1	1.069	-3.2
XVI	.16	1.0	.3	.2	.2	.588	+1.4	1.040	-5.9
IV	.21	.2	.0	.4	.2	.581	+ .2	1.101	- .4

TABLE V

ORIFICE	DIAM. mm.	REMARKS	LAWRENCE GAS		OXYGEN	
			GRAVITY	% ERROR	GRAVITY	% ERROR
XIV	.?	Irregular	.582	.3	1.108	.3
X	.24	Burrs	.588	1.4	1.108	.3
XII	.30	Burrs	.599	3.3	1.097	.7
XIII	.24	Irregular	.594	2.4	1.104	- .1
XV	.?	Burrs	.585	.9	1.102	- .3
VIII	.24	Burrs	.585	.9	1.100	- .5
IV	.21	Smoothe	.578	- .3	1.104	- .1

TABLE VI

Orifice		Mercury Head mm.		Length of Line on Chronograph Sheet inches			Lawrence Gas		Oxygen	
No.	Diameter mm.	Start	Finish	Air	Gas	Oxygen	Sp. Gr.	% Error	Sp. Gr.	% Error
XVII	.17	135	9	23.66	17.90		.577	+.7		
XVII	.17	135	9	46.94	38.59		.574	.0		
XVII	.17	135	9	23.58		24.71			1.101	-.2
XVII	.17	135	9	46.84		49.15			1.100	-.3
IV	.21	135	9	15.84		16.66			1.106	+.3
IV	.21	135	9	31.68		33.22			1.100	-..3

[4]Technologic Paper 94.

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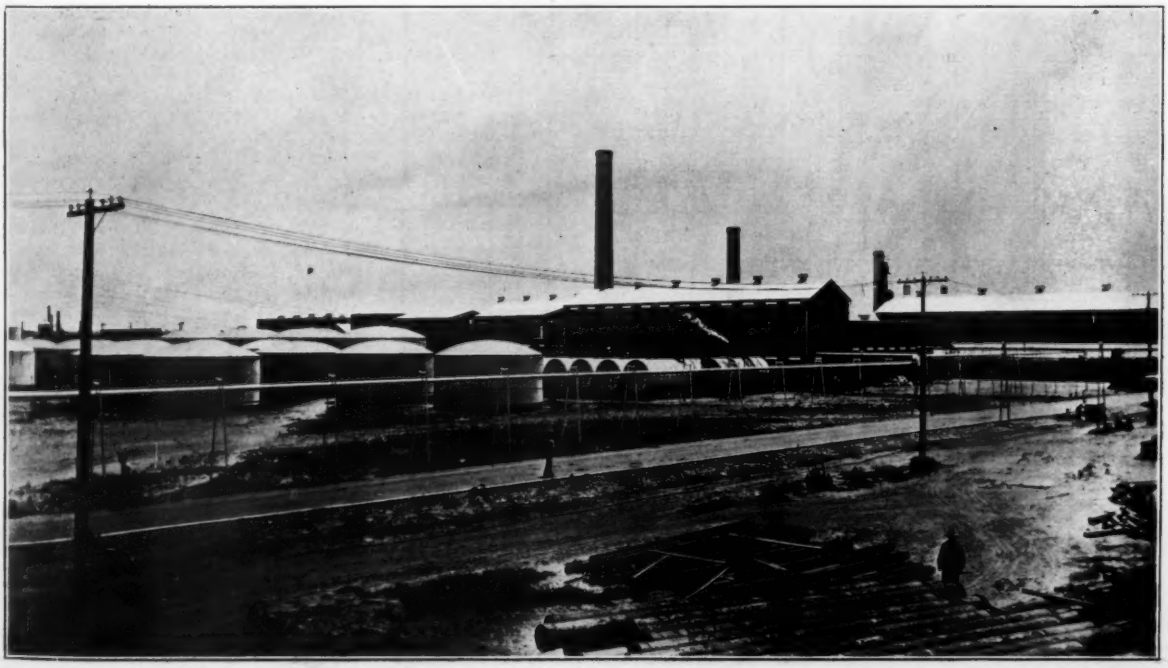

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in stop watch readings and to eliminate any error due to a variation in size. The 118 cc. bulb was used with a water head of 121 mm. at the start and 6 mm. at the end. The gravity of the Lawrence City gas and of the oxygen was taken using six different irregular orifices, and one regular orifice. The results obtained in the experiments were as follows:—

The specific gravity of the gases is calculated on the gravity of the gases saturated with water vapor, which is .580 for the Lawrence gas and 1.105 for oxygen. Photomicrographs were taken of the irregular orifices and also of a few of the typical orifices which were ground smooth and were free from burrs and irregularities. They are shown on the following pages.

There seemed to be no definite relation between the degree of irregularity or roughness of the orifices and the specific gravity. In fact, it was surprising that orifice XIV, which was the most irregular of all the orifices should give an accuracy of .3 per cent, which is as high a degree of accuracy as might be expected from any water type of the effusion apparatus. The orifice had, as shown in the photograph besides the large irregular orifice several smaller openings. Orifice XIII, which gave a high result with natural gas, had a crack in the platinum foil which extended for some distance away from the orifice. Orifice XII, which had only burrs around the edge of the orifice, gave the highest percentage of error of any of the orifices. All the results given with oxygen were quite satisfactory. It would seem from this that no special precaution necessarily need be taken to make the orifice regular. This cannot be entirely true, however, for if burrs are left on the orifice they will catch fine dust particles which are likely to be in the escaping air or gas and in such case will give an inaccurate effusion time. Any condensing water vapor also will be more likely to cling to the burrs and cause an inaccuracy in the effusion time.

Effect of Drafts

While the errors due to drafts were found to be only appreciable, especially with a small draft, any draft is always to be avoided. For example there are such factors to consider as temperature changes and the liability of dust being caught in the draft and some of it lodging in the orifice. Another factor to consider is the type of orifice tip used. Figure 6 shows two types of orifices which are commonly used. The type of orifice (a), which was used in the tests, is the type generally used and is the more satisfactory type (b) being much more liable to give inaccurate results, especially when the orifice tip is in the vicinity of drafts. It is apparent that with type (a) the drafts cannot come in direct contact with the escaping gas, while with type (b) such can be the case. Type (a) should, therefore, be used with the effusion apparatus.

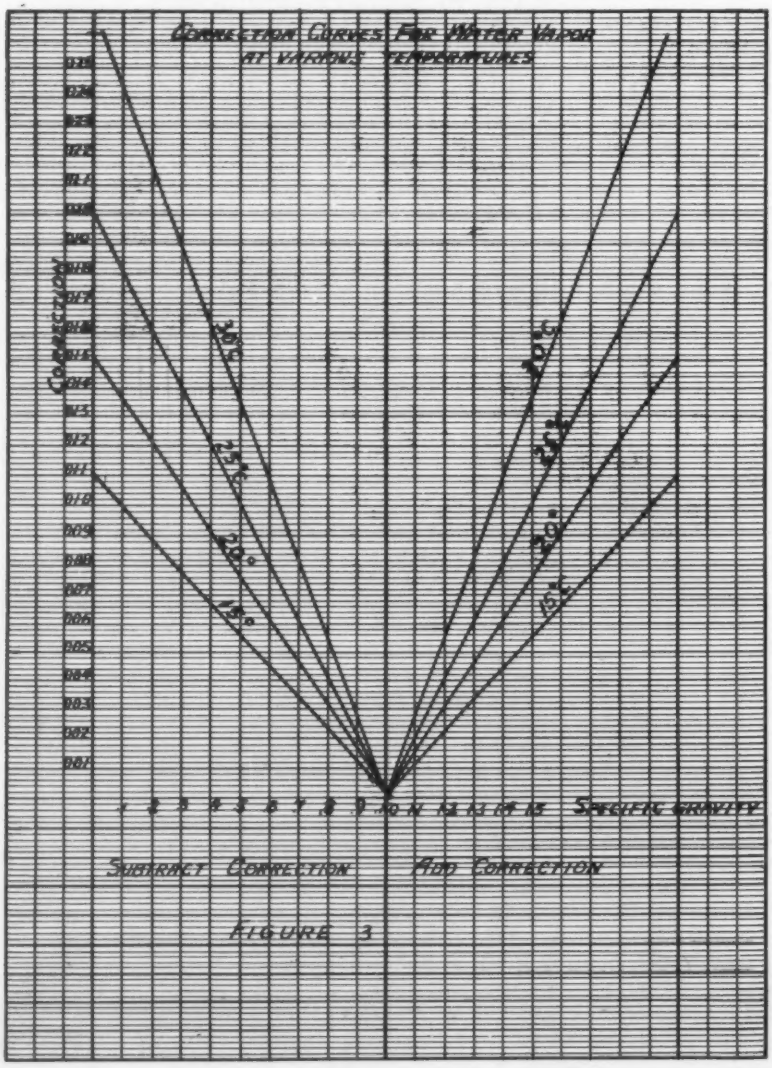

FIGURE 3

Method of Using Mercury as the Confining Liquid in the Effusion Method

When mercury is used as the confining liquid, the error due to water vapor is eliminated. It is evident that the gas and air will be saturated with mercury vapor but the vapor pressure of mercury is so low at ordinary temperatures that the error is inappreciable. The formula

$$S_g = \frac{(t_1)^2}{(t_2)^2}$$

is in reality only an approximate ratio but by using mercury as the confining liquid and avoiding possible errors due to sources other than water vapor, a satisfactory degree of accuracy can be obtained.

The effusion pressure, when using mercury, is considerably increased and the effusion time, likewise, decreased according to the size of orifice used. It is, therefore, necessary for accurate work to use some automatic timing device. In this work a chronograph apparatus was used for observing the time of effusion. The chronograph had a rotating drum on which the record sheet was placed and could be calibrated to read in seconds. It is not necessary, however, to have the sheet calibrated, since the values are only relative and may be measured with an engineer's scale and given in inches. The lines which represent the effusion time were measured to .01 to .02 inches, which represents a time of about .02 to .04 second.

The chronograph[5] used was made by Val Arntzen of Berkeley, California and is considered to be a very good instrument, being the type that is ordinarily used in any observatory recording the time of observations. It is much larger than the tape chronographs but the record sheet used is much more convenient to file. The apparatus consists of a drum rotated by a weight clock work, which drum can be rotated at the rate of one or two revolutions per minute. An electro magnet carrying a pen makes a trace on the sheet which is wrapped around the drum. The chronometer can be adjusted so as to cause a break in the circuit every second thus producing a break in the trace. This, therefore, enables the observer to scale the time as recorded on the sheet. More details concerning the apparatus may be found in the reference.

The apparatus used and system of wir-

[5]Campbell's Practical Astronomy.

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ing are shown in Figure 7. The two contact points were made of platinum wire and were sealed above and below the effusion bulb, as shown. The bulb B is the leveling bulb and sets upon a stationary support. A glass T tube was sealed above the effusion bulb A and the platinum orifice tip sealed to the tube above the T. A rubber tube is fastened to the inlet T and the inlet closed by means of a pinchcock. The orifice tip is also closed at the top by means of a rubber tube and pinchcock. The two bulbs are connected by means of rubber pressure tubing so that bulb B can be moved from its support for use as a leveling bulb in filling the apparatus with the desired gas.

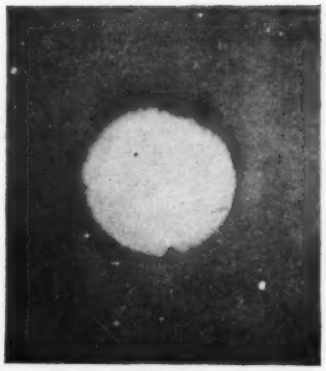
The system of wiring is also shown in the diagram of Figure 7. The apparatus is wired so that when the mercury touches the platinum contact point below the bulb the circuit is completed. The switch is then opened and the circuit broken, the circuit being again completed when the mercury touches the platinum contact point above the bulb.

The procedure for making a determination was as follows: Air which was previously dried by means of calcium chloride and phosphorous pentoxide, was drawn into the apparatus by lowering the leveling bulb, allowed to escape through the orifice and this process repeated several times until the apparatus was sufficiently purged. The apparatus was then filled with air, the orifice tip closed with the pinch cock, and the leveling bulb placed on its support. The cylinder on the chronograph apparatus was set revolving and the marker set in place. The pinch cock was then removed from the orifice tip and the air allowed to escape. The switch was set so as to make contact with point a at the start and when the mercury reached this contact point, the marking pen would jump to the side, the switch was then thrown open and the pen would jump back. The switch was then set to make contact with point b and the same process repeated with the second contact point on the bulb as with the first. The key which was in the circuit was used for marking the beginning and end of a run, three short dashes after a dash showing contact denote the beginning of a run and three long dashes denote the end. A typical chronograph sheet giving the results of a number of runs is shown in Figure 8. This same procedure was then followed with the gas and the results were calculated by the following formula:

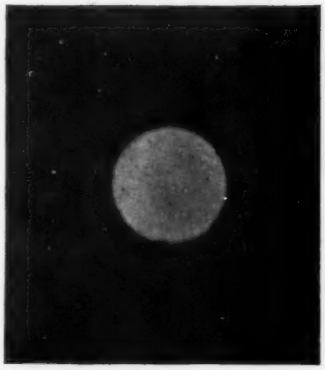
$$S_g = \frac{(\text{Length of line for gas in inches})^2}{(\text{Length of line for air in inches})^2}$$

Results obtained by this method of determining specific gravity are given in Table VI. The results given in this table show that the results obtained are more nearly like the true gravity than results obtained when using water as the confining liquid. This is, of course, due to the fact that with the mercury the gas and air are both in a dry state. It is advisable to use this method therefore whenever it is practical and since it is quite essential that an automatic timing device be used, the method is practical only for laboratory use. The effusion

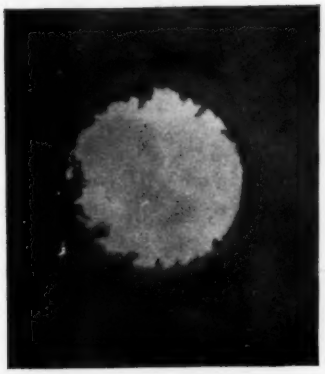
Orifice XIII



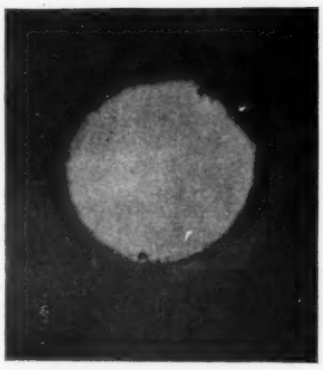
Orifice VIII



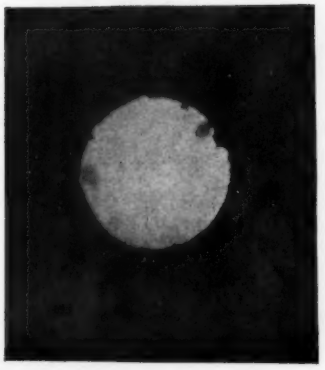
Orifice VII



Orifice XI



Orifice XII



Orifice X

Figure 4

time for the runs was thirty seconds and less, so that in using a stop watch, the error in the readings would ordinarily be too large for the accuracy desired. While the use of mercury affords a satisfactory and more accurate method, it must be kept in mind that such factors as mecury head, size of bulb, temperature, etc., must be taken into account. The conditions given and methods of operating are believed to be the best for obtaining the desired results.

General Conclusions

1. The Gas Density Balance method and Direct Weighing Method for determining specific gravity of gases are recommended when accuracy is the important factor in the determination. The first method is adapted to either field or laboratory use, the apparatus being made in two types, field and laboratory, while the second method can only be used in laboratory work. Both the methods afford an accuracy of .1 to .3 per cent but require a certain amount of technique and are not advisable for use except by an experienced analyst. Technique of operation of the Gas Density Balance (Edwards) can, however, be developed without a great amount of practice and this method is recommended as a standard for field work while either of the above mentioned methods can be used as a standard for laboratory work.

2. The accuracy of the method of calculating the specific gravity from the analysis depends entirely on the accuracy and completeness of the analysis. The method is recommended only when the

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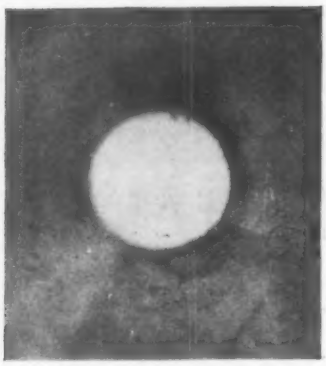
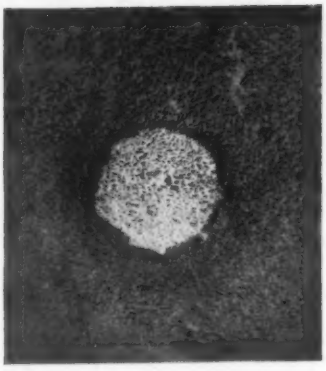
Orifice XVI

Orifice XIV



Orifice XVIII

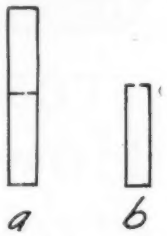


Orifice XV

Figure 6

analysis is made by an experienced analyst; when a complete analysis of the gas is at hand; with natural gas when the combustion method is used providing the residue is practically all nitrogen and the total hydrocarbons low in higher hydrocarbons (in other words the natural gas should be low in residue and high in methane); with natural gas also when the method of fractional distillation is used for the analysis. It is well to remember, however, that gravity calculations of the hydrocarbon constituents compensate to a certain extent. This is explained by the fact that the percentage of the hydrocarbons is often in error (the per cent methane being high and that of ethane being low) due to the absorption of carbon dioxide formed in the combustion and the variations of the percentages of hydrocarbon constituents are usually such that they compensate to a certain extent. An accuracy of .1 to .3 per cent is often obtained under such conditions as are mentioned above, though ordinarily the degree of accuracy is not so high. The method is not recommended for use with an explosion analysis because of the formation of nitrogen oxides which introduces considerable error.

3. The above three methods can be used as standard methods for determining specific gravity (the method of calculation from the analysis only under the conditions mentioned) but the effusion method is recommended when it is necessary to obtain only approximate results. Apparatus for the effusion method, however, is less expensive, and can be assembled at most chemical laboratories.



The method combines rapidity with ease of manipulation and a fair degree of accuracy.

4. Below are given some precautions and recommendations regarding the effusion apparatus when using water for the confining liquid:

a. The apparent gravity should always be corrected for water vapor. It is preferable however to standardize the appara-

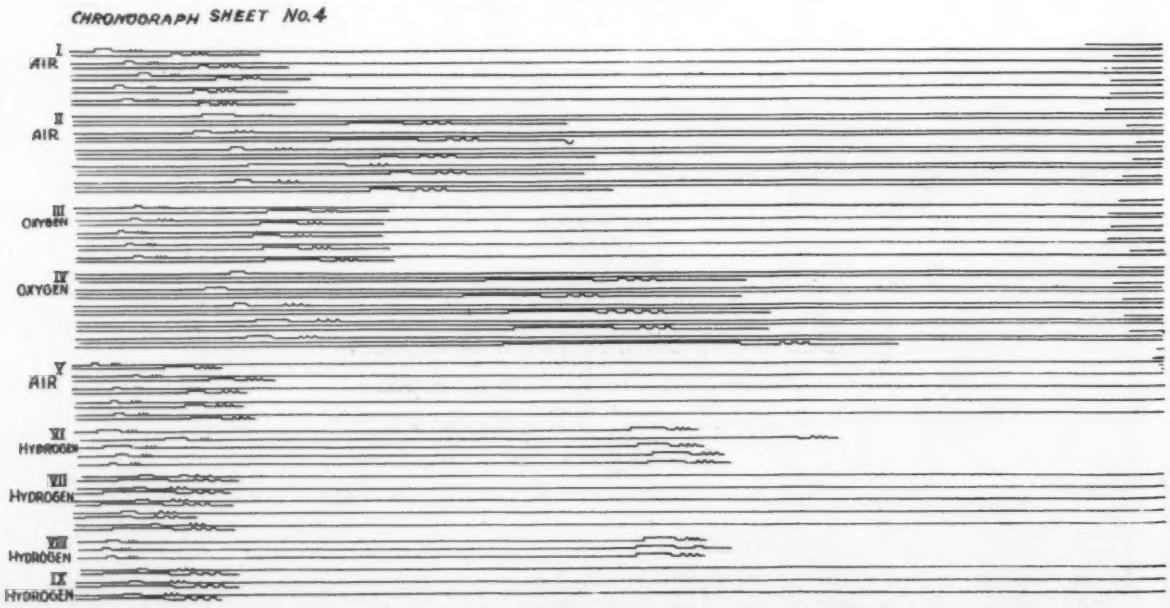


Figure 8

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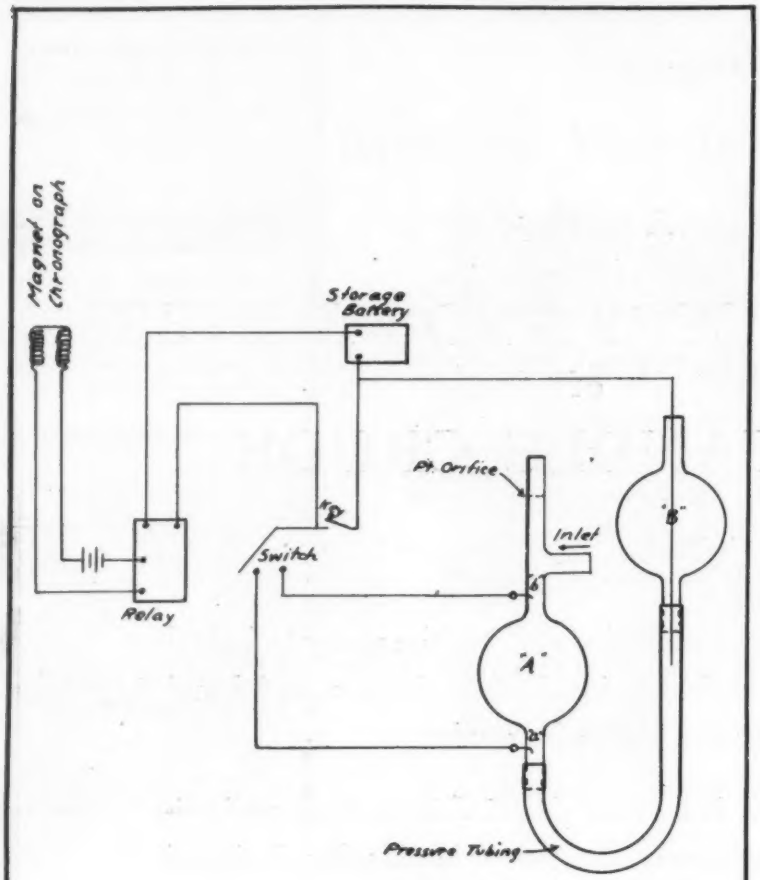

WIRING DIAGRAM OF MERCURY EFFUSION APPARATUS.

FIGURE 7.

tus by the Direct Weighing Method or Gas Density Balance Method of analysis and then apply the correction factor found to results obtained by the effusion method.

b. Temperature should remain constant throughout the experiment and preferably should not be above 30 degrees C.

c. The time of effusion recommended is 90 to 120 seconds. A shorter time gives too much error in stop watch readings and a longer time requires too much time for making a determination, which affords more chance for temperature changes. The time of effusion is governed by the size of bulb, diameter of the orifice, and the specific gravity of the effusing gas. An apparatus with a bulb 50 to 100 cc. in volume and with an orifice .2 to .3 mm. in diameter gives the desired results.

d. The inside of the tube should be kept clean to eliminate any unnecessary friction and to prevent the water from adhering to the tube.

e. Although good results may be obtained with wide variations of water-head, it is advisable to use as small a water-head as possible for the start and a water-head of about 1 to 2 inches for the finish.

f. The orifice used should be smooth, round and free from burrs. Though an orifice of this type will not necessarily show any appreciable difference in results from an irregular orifice it will give more consistent results.

g. Determinations with the method should preferably be made in a place free from drafts.

5. The methhod of using mercury as the confining liquid is very satisfactory and gives results which are quite comparable to the true gravity of the gas if an automatic timing device with which the time can be measured to approximately .05 seconds, be used. The accuracy of the method is .3 to .5 per cent.

Union Oil Company Enlarges Refining Capacity

Los Angeles, California.—Three new refining plants and enlargements on two others have been completed by The Union Oil Company, greatly increasing that company's gasoline output.

New absorption and compressor plant on the Stearns property will increase natural gasoline production to about 150,000 gallons daily, with gas production of about 100,000,000 cubic feet daily, including 40,000,000 cubic feet circulated by compressors. Dry gas is to be delivered to oil wells where the gas lift process is being used, by these compressors. As a result of this new development, a gasoline line has been built from the Stearns and Richfield properties to the Los Angeles refinery.

New Cross and Black units being used with the high pressure cracking plant at Los Angeles, will have a total daily capacity of 10,000 barrels of crude.

The Edeleanu plant at the Oleum refinery, where most of the Union's lubricants, greases and asphalts are produced, is practically completed. It is designed to economically produce kerosene of superior quality by the Edeleanu sulphur dioxide process.

Output of the Bakersfield refinery will be doubled to 5000 barrels of crude oil a day. The Brea refinery, destroyed by recent fire, is being rebuilt and will have a capacity of 5000 barrels. The five refineries now operating have an aggregate running capacity of 80,000 barrels of crude daily.

Furnace Inspection Made Easy by Peep-Hole Door

Inspection of furnace conditions in comfort and without eye strain has been made possible through a recently perfected Peep-Hole door for boiler furnaces, by The Springfield Boiler Company, Springfield, Illinois.

The Peep-Hole Door consists of a square plate with a five-inch round opening and a revolving shutter having three positions: closed, completely closing the opening; inspection position, placing a special colored glass over the opening so that true conditions within may be ascertained without glare or uncomfortable heat; open, allowing the insertion of steam lance or slice bar.

With this door, the fire may be worked without opening a door and admitting cold air above the firebed.

The door complete weighs 50 pounds.

Further information may be obtained from the company upon request.

A heat exchanger and condenser in one

Note the multiple shells of the G-R Sectional Condenser

With two sections, water can be used as the cooling medium in one unit and oil in another, thus providing a condenser and heat exchanger in one set.

Furthermore, a different "cut" or "fractionation" can be made in each section by offsetting the lower vapor connection to the side of the shell and draining the distillate from the sump thus formed in the vapor space.

And note, too, the many operating advantages of this arrangement. Sections can be added or removed to meet varying capacity requirements. The complete unit is readily transported and assembled if necessary to meet changing plant conditions. Inspection and cleaning is greatly facilitated.

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Mineral Seal Oil Heat Exchangers

A compact, twin exchanger with strict counter-current flow to promote maximum rate of heat interchange.

G-R Vaneflo Gas Cooler

for cooling casing head or natural gas. Can be used as inter-, after-, or precooler in absorption and compression type natural gasoline plants. Has low pressure loss and exceptional efficiency.

G-R Jacket Water Cooler

uses any source of raw water to cool the jacket water from oil and gas engines and compressor. The famous Multiwhirl Cooler—over 2000 in operation in every liquid cooling service.

G-R Gasoline Condenser

for condensing natural gasoline vapors in casinghead gasoline plants. Can also be used as a knockout box or fractionating tower control section with particularly close control of the end points.

G-R Twin Heat Exchanger

for the efficient interchange of heat between crude oil feed stock and still bottoms, cold water and hot oil, feed stock and hot still vapors, etc.

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R 9-26

The Termination of Charcoal Tests

By F. L. Kallam
Superintendent, Mutual Gasoline Company, Los Angeles, Calif.

One of the most important features of testing natural gas for gasoline content by means of activated charcoal is the knowledge of when to terminate the test. This paper deals with a method by which the maximum gasoline content may be determined without danger of under or over-saturating the charcoal when even the approximate content of the gas is unknown. It points out that the correct termination point is determined from the temperature rises and falls in the charcoal due to the adsorption and displacements of the various hydrocarbons. The modifying effect of the condensing phase of the problem is also discussed and conclusions drawn.

IN testing natural gas for gasoline content a metered amount of gas is allowed to pass through a tube containing activated charcoal. The gasoline adsorbed by the charcoal is then recovered by means of distillation with glycerine and the volume of the condensate noted. With this information at hand the gallons of gasoline per thousand cubic feet of gas is readily calculable.

2. To arrive at the maximum gasoline content of any particular gas it is necessary to pass the correct volume of that gas through the charcoal. The knowledge of this volume, relative to the amount of charcoal used, or when to terminate the test, has been more or less optional with various operators, with the result that check tests are infrequent. By standardizing upon a method for determining this maximum test point, considerable advance will have been made in determining gasoline yields from natural gas.

The Heating Phenomenon

3. When wet gas is first passed through a tube filled with activated charcoal, rapid adsorption takes place, as is evinced by the heat generated at the first point of contact. This zone of heat gradually moves along the tube, leaving the layer of charcoal first in contact with the gas, cool. On very rich gas the heat generated is ofen so intense that it is impossible to keep one's hand on the metal tube. If the gas is allowed to flow through the tube for a long enough period, the heat zone will traverse the entire length of the tube, leaving the body of the charcoal at the original temperature. This phenomenon is familiar to all operators.

4. In view of this peculiarity, it has been assumed that this heat wave is related in some manner to saturation of the charcoal with constituents of the gas. However, no indication is given as to the degree of gasoline adsorbed relative to the other components of the gas. Consequently, conditions existing in the charcoal at the point of gas exit have been investigated. As this region of the charcoal is saturated last, it is logical to presume that the best indication for stopping the test will be obtained at this point. This can be accomplished by placing a properly scaled thermometer in the open end of the tube, so that the bulb is entirely covered with the charcoal, and noting the temperatures. The packing of glass wool between the thermometer and the tube wall will prevent loss of carbon due to gas velocity.

Temperature Rises

5. Passing gas through a tube arranged as just described shows several interesting temperature changes. Fig. 1 gives the results of temperature measurements obtained when passing various amounts of a rich gas through a tube containing 250 c.c. of 8 to 14 mesh charcoal. The four characteristic temperature rises and falls typical of all wet gases, is clearly illustrated. In some cases even a fifth rise and fall has been observed, although for such a point the rise, instead of being obtained as a distinct increase in temperature, is found as a period of constant temperature followed by a gradual decrease. In fact, the above may be said to be true for the fourth rise in some cases, especially with very dry gases. It is believed that with suitable apparatus, the fifth rise might more readily be detected, as perhaps might a sixth and even seventh point. Because of the consistency of these characteristic temperature changes with the various gases, it is assumed that the number and intensity of the rises are governed by the number and percentage of members of the paraffin hydrocarbons present in the gas.

Constant-Volume Adsorption

6. From numerous tests it has been determined that charcoal will absorb practically a constant volume of hydrocarbons from a gas regardless of the volume passed through the carbon. This is of course, assuming that a sufficient quantity of gas is first passed through the charcoal to furnish hydrocarbons in volume to fill the surface and capillaries of the charcoal. The passing of more gas than this amount will not increase or change the volume of hydrocarbons adsorbed. With these ideas in mind it is now in order to correlate the temperature rises and the gasoline adsorbed when using activated charcoal.

Replacement of Air and Moisture

7. Referring again to Fig. 1, it will be noted that with the initial passage of gas through the charcoal a slight drop in temperature takes place. This may be attributed to the fact that the gas is replacing air and moisture contained in the charcoal. In no case should this initial momentary drop be mistaken for a temperature rise-and-fall point.

First Saturation Point

8. Charcoal possesses the inherent property of adsorbing the gasoline constituents of a gas most readily, showing marked preference for heptane, hexane, and pentane in the order named. Analysis of numerous gases shows that these hydrocarbons are always present to a lesser degree than the lighter members of the paraffin series as butane, propane, ethane, and methane. Of these latter, methane generally predominates, and for this hydrocarbon, charcoal shows the least inclination to adsorb and retain. Thus when gas first comes in contact with charcoal, there is not enough heptane, hexane, and pentane present to satisfy the capillary capacity of the charcoal, with the result that butane, propane, ethane, and methane, are also adsorbed. In other words, with the first fractional volume of gas exposed to the adsorbent, all of the hydrocarbons present are adsorbed and condensed within the pores of the charcoal. The charcoal continues to adsorb until the condensed hydrocarbons equal in volume the volume of the capillaries, and up to this point, no hydrocarbons escape adsorption. As more and more gas

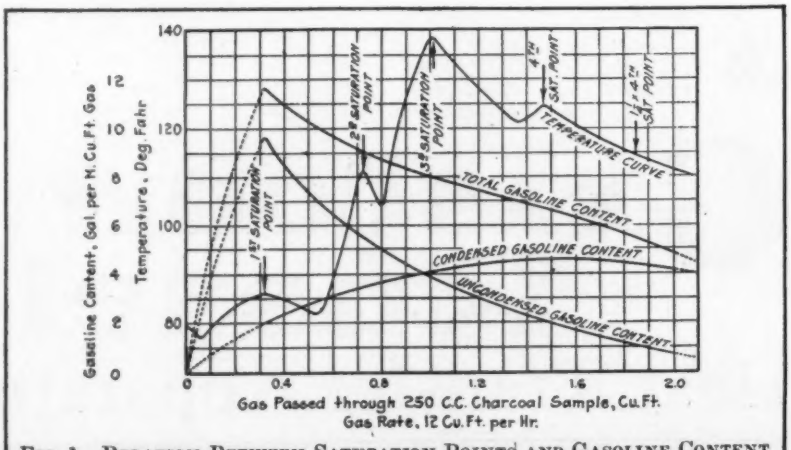

FIG. 1 RELATION BETWEEN SATURATION POINTS AND GASOLINE CONTENT

*Presented at the spring meeting, San Francisco, Cal., June 28 to July 1, 1926, of The American Society of Mechanical Engineers, 29 West 39th St., New York. All papers are subject to revision.

Will it stand the gaff?

That one point must be proven before any commodity can be put on the market and endure.

Into the design of a motor car or truck, a fire hose or a paint, must be built the qualities that will stand up under most severe service.

Therefore, guesswork must be eliminated—the men responsible for design and formulating must know what will be met with in the field—in service—and they must prove by long and exhaustive tests that they have met the requirements.

That is the way Silvr-Cool the super-aluminum paint was designed and produced. By men who know the exposure and service conditions in the oil fields. It has passed through years of successful tests, proving that fundamentally it is right.

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enters the charcoal, beyond this point, a greater amount of heavier hydrocarbons are presented for adsorption; but in order for the charcoal to hold these, it is necessary to provide the capillary volume. This it can do only by releasing some already adsorbed constituents, and these will be the ones for which it has the least affinity.

9. This is the condition existing in the charcoal at the top of the first temperature rise (Fig. 1), or first saturation point, as it will hereafter be called. The rise in temperature up to this point can thus be said to be due to the heat of adsorption of the various hydrocarbons, and in particular to methane, because of the latter's greater predominance in the gas.

10. It is at this first saturation point that the maximum gasoline content will be found, bearing in mind the relation between gasoline and gas volumes. This content we shall consider as one hundred per cent of that attainable. However, due to the composition of this gasoline as previously explained, exorbitant condenser pressures would have to be applied, accompanied by low temperatures, in order to secure complete condensation. Such gasoline, even if produced, would at present have no commercial value because of its volatility.

11. Consider the example given, Fig. 1, and assume the test terminated at the first saturation point, or, after 0.31 cubic feet of gas had passed through the charcoal. Upon distillation of the charcoal, to recover the gasoline adsorbed from this amount of gas, and condensing the vapors given off in the usual laboratory ice-bath condenser at atmospheric pressure, the condensate would be such as to show a gasoline content for the gas tested of two gallons per 1000 cubic feet. This would be misleading information unless it were realized that a greater part of the vapors were being uncondensed; in this case enough to give a content of 9.6 gallons per 1000 cubic feet. Hence if all the vapors were condensed the total gasoline content would be 11.6 gallons per 1000 cubic feet of gas. This means that at the first saturation point for the particular gas examined, and standard conditions of condensing, a content of only 17 per cent of that adsorbed can be shown.

The Second Saturation Point

12. It now remains to be seen what hydrocarbons will be released after the first point of saturation is reached in order that the charcoal may avail itself of the more desirable gasoline constituents. Obviously, this will be methane, for which the charcoal has the least attraction. This expulsion of methane is clearly shown in Fig. 1 by the fall in temperature after the first saturation point, showing that the heat of adsorption during this period is utilized to revaporize the methane. Adsorption is all this time taking place, except that of methane which from now on passes unmolested through the charcoal. This is shown by the temperature again rising, signifying adsorption of heavier hydrocarbons. To secure the required volume, the charcoal selects ethane to a greater degree than before, where previously it adsorbed methane. The extent of these replacements will of course be controlled by the individual constituents and composition of the gas under test. Thus at the second saturation point we find the condition that for the charcoal to adsorb further, it will be necessary to replace the lightest hydrocarbon already adsorbed, ethane, in order to provide capillary volume.

13. The gasoline now available in the charcoal for extraction, by virtue of the absence of all methane, is slightly more stable. From the example it will be seen that the total maximum content is now nine gallons per 1000 cubic feet, and that by atmospheric condensation, a content of 3.4 gallons. This latter amount is 38 per cent of that obtainable.

The Third Saturation Point

14. Passing the second saturation point, we find ethane being replaced by heavier hydrocarbons, of which propane is in the greatest volume. Now, two constitutents, previously adsorbed by the charcoal, are allowed to pass through unadsorbed, methane and ethane. The result is that the third saturation point designates that for further adsorption to take place, the propane will have to be replaced.

15. The gasoline adsorbed and held by the charcoal at the third saturation point is still very "wild," due largely to the amount of propane present. Continuing the example, the total gasoline content is seen to be 8 gallons, while the condensed gasoline yields a content of 4 gallons per 1000 cubic feet of gas. It can be readily be seen that 50 per cent of the available gasoline content is now obtainable by atmospheric condensation.

The Fourth Saturation Point

16. As before, passing a saturation point designates that the lightest hydrocarbon held up to this point is being replaced, this time being propane. All methane, ethane, and propane coming in with the new gas now passes untouched through the charcoal, while all the butane, pentane, hexane, etc., is adsorbed. Here again there is a deficiency in the volume of the heaviest hydrocarbons, so that a very large amount of butane is adsorbed in order to satisfy the charcoal as regards volume of hydrocarbons held. When this volume is obtained, the fourth saturation point has been reached as shown by the fourth temperature rise in Fig. 1.

17. Sixty-seven per cent of the total gasoline content, or 4.5 gallons is the result obtained by condensation at this point in our example. This content is, however, only 37 per cent of the total content obtained at the first saturation point.

The Total Saturation Point

18. Continuing past the fourth saturation point, the butane is replaced by the heavier hydrocarbons in the incoming gas, of which pentane is in the greater percentage. Hexane will be adsorbed (and other heavier hydrocarbons if they are present) more readily than pentane, but the latter is required to furnish the necessary volume. The fifth point of saturation will thus correspond to the point where all the pentane will have to be replaced in order for further adsorption to take place.

19. This process of replacement continues until a sufficient volume of the heaviest hydrocarbon present in the gas to fill the capillaries of the charcoal has been passed through the latter. From this point, on no hydrocarbons will be adsorbed; all passing unadsorbed through the charcoal. The condition is the total-saturation point, and the gasoline content based on this volume will perhaps be only five per cent of that shown at the first saturation point. But of course, practically all of the gasoline adsorbed at this point will be condensed. The stability of this product is very great, but not as great as one would expect. It seems that while charcoal replaces or selects the heavier hydrocarbons in preference to the lighter ones, some of the latter are absorbed or dissolved in the heavier members of the series, which in turn are retained by the charcoal. This secondary adsorption is naturally small, but does account for some of the unexpected vapor pressures encountered at times in charcoal gasoline.

Commercial Natural Gasoline

20. From the analyses of many samples of natural gasoline, it has been found that very few, if any, hydrocarbons lighter than propane are present. This is due of course to their exceptionally low boiling points. Propane is found to the extent of 1 to 5 per cent, and while it too has a low boiling point, it cannot be freed from the gasoline without carrying away with it other heavier and more valuable gasoline constituents. Hence propane is a serious and objectionable constituent of gasoline, being of such nature as to be commercially detrimental. By eliminating propane, a greater amount of butane may advantageously be contained in gasoline without abnormal losses in handling.

21. At a risk of repetition it is desired to point out that at the fourth saturation point the charcoal contains butane and all the heavier hydrocarbons present in the gas. These constitute a gasoline in which dissolved gases are minimized, with the result that losses are due mainly to the evaporation of true liquid constituents. This being a highly desirable commercial product, it follows that the fourth saturation point will always assure the adsorption of the maximum commercial natural gasoline constituents from a gas by charcoal. This then, is the proper point at which to terminate the test.

The Distillation Effect

22. However, inasmuch as a gasoline determination is composed of three distinct operations, adsorption of the gasoline (as has already been discussed) and the subsequent distilling and condensing, it is necessary to consider these latter two factors before drawing final conclusions as regards the proper termination point for the test.

23. The function of distilling the gasoline from the charcoal may be briefly discussed and dismissed. All of the gasoline may be removed from the charcoal, regardless of the point of saturation at

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THE initial of the 670 Oil insures easier fractionation and is especially beneficial in plants which are overloaded. This oil has a short boiling range of 160 degrees, which is the result of a low molecular weight, indicating thereby a better capacity for gasoline and especially the higher boiling point constituents in natural gasoline. The 670 Oil is particularly adapted to straight steam stills, whereas the 630 grade is refined for fire or combination distillation where a lower initial oil would be more advantageous, maximum stripping of the oil being accomplished with less heat.

SUNOCO Absorption Oils actually do reduce overhead costs in plant operation and increase yields of natural gasoline over other oils.

Samples and quotations will be furnished upon request.

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which the adsorption test was stopped. This is easily accomplished by the application of heat and some vaporizing agent, as glycerine, mercury, oil, etc., which will replace the gasoline in the pores of the charcoal. The heat applied must be of such intensity as to vaporize and carry the gasoline into the condenser. Distillation may take place under any convenient or desired pressure.

The Condensing Effect

24. By stopping the test at the fourth saturation point we are assured of condensing, within the pores of the charcoal, a volume of desired gasoline which will give a maximum gasoline content for the gas. But in order to obtain this content, it is necessary to recover this adsorbed gasoline by distilling and condensing. As a result of countless tests however, using 250 c.c. of 8 to 14 mesh charcoal and distilling and condensing equipment having the same dimensional ratio to each other in every instance, it has been found that the maximum gasoline content is not always obtained at the fourth saturation point.

25. This is because condensing at atmospheric pressure and 32 degrees F., it would only be possible to obtain approximately complete condensation if the vapors handled were 100 per cent butane. Naturally, with the vapors composed of butane plus heavier hydrocarbons, together with air and other fixed or uncondensable gases, the partial pressures on each constituent in the condenser will be lowered to such an extent, that condensation is not as effective as it would otherwise be. It can be seen from this that the development of a general law covering all cases of testing is impossible because of our present lack of knowledge regarding the composition of the various individual gases.

26. One remedy for such a condition is to run the test past the fourth saturation point, or in other words, displace, at least to some extent, the butane with pentane. It has been found however, that the maximum test always lies within a narrow limit, that is between the fourth saturation point and a point which corresponds to 1.25 times the volume at the fourth temperature rise. This latter point may be defined as the saturation of the charcoal secured by passing 1.25 times the volume of gas required to reach the fourth saturation point through the charcoal. This rule holds for wet gases ranging from one-half gallon upward. For gases with one-half to two and one-half gallon contents the 1.25-point has been found very satisfactory for the maximum yield, but for the richer contents, the fourth saturation point will give slightly higher results. This is probably true because these gases contain greater percentages of pentane, hexane, etc., and hence smaller amounts of butane, so that it is unnecessary to displace any of the latter.

27. By resorting to pressure condesation, it is possible to recover 95 to 97 per cent of the gasoline (by weight) adsorbed by the charcoal at the fourth saturation point. This makes it convenient for field testing, as the adsorption can be stopped in every case at the fourth saturation point. A pressure of 45 pounds per square inch absolute and a temperature of 60 degrees F., will assure of this degree of condensation in practically all cases. Though here again, dimensions of condenser and still, relative to the size of sample used and vapors handled, will have a bearing upon consistent check results. Even after weathering condensate obtained by this method to atmospheric conditions, with a loss from 10 to 15 per cent, a higher yield will be obtained for the same gas than will be by atmospheric condensation. This advantage is due to the vapor pressure-temperature relation gained by increasing the pressure of condensation.

Conclusions

28. The following conclusions may be drawn from what has been presented:

a It is possible to fractionate the hydrocarbon constituents of natural gas by the use of activated charcoal.

b Commercial natural gasoline contained in a gas should be construed to mean gasoline containing butane and all heavier hydrocarbons present in the gas.

c There is a definite relation between the volume of gas sampled and amount of charcoal used in order to obtain a maximum test of the commercial natural gasoline contained in the gas.

d For atmospheric pressure and 32 degrees F., codnesation the maximum test for wet gas will be obtained in all cases between the fourth and 1.25 times the fourth saturation point for any particular amount of charcoal. This assures of neither under nor over-saturating the charcoal. For gases ranging between 0.5 and 2.5 gallon content, the test should be terminated at 1.25 times the fourth saturation point. For gases ranging from 2.5 gallons and up, the test should be terminated at the fourth saturation point.

e When condensing under 45 pounds per square inch absolute and 60 degrees F., all tests may be stopped at the fourth saturation point. This method will give higher results than will atmospheric condensation.

P & R Employees Work by Regulations

AS A RULE, each corporation has its own ideas as to the reasons for which an employee shall be discharged—such ideas usually depending upon the general policies of the company and the manner in which those policies are carried out by the executive officers of the company. To maintain definite policies, rules must be provided—these, of course, being valueless unless they are enforced.

Producers and Refiners Corporation, which has its own producing, transporting, and marketing facilities, and, in addition, operates refineries at Parco, Wyoming, and Tulsa and Blackwell, Oklahoma, has met this problem by listing the offenses for which an employee may be discharged. In its refinery organization, this list is posted at a score or more of places about the refinery, so that at no time will the discharged employee have reason to attempt to alibi himself by stating that he did not know that the reason for which he was discharged was an offense.

Below is shown a copy of the list of offenses just as it is posted on the bulletin boards at various locations in the plant:

Producers and Refiners Corporation
NOTICE TO ALL EMPLOYEES
The Following Is the List of Offenses For Which an Employee May Be Suspended or Dismissed Without Further Notice.

1. Violation of Any Law.
   (a) Carrying concealed weapons; fighting or attempting bodily injury to another; drunkenness; conduct which violates the common decency or morality of the community.
   (b) Stealing, or malicious mischief resulting in the injury or destruction of property of other employees or of the company.
   (c) Cruelty to animals which are the property of other employees or of the company.
2. Violations of the Following Safety Rules:
   (a) Carelessness in regard to accident and safety of fellow-workmen.
   (b) Riding on standard or narrow gauge equipment or on any moving machinery where not assigned.
   (c) Running up blocks on cranes.
   (d) Violation of rules governing employees in repairing or oiling moving machinery.
   (e) Failure to wear safety goggles that have been provided.
   (f) Smoking or carrying matches other than safety matches or having open lights or fires except within prescribed limits where such practice is authorized.
3. Failure to immediately report accidents or personal injuries to the delegated authority wherever possible.
4. Insubordination (including refusal or failure to perform work assigned) or use of profane or abusive language toward fellow employees or officials of the company.
5. Absence from duty without notice and permission from superintendent or foreman except in case of sickness or cause beyond his control of a character that prevents his giving notice.
6. Harboring a disease that on ac-

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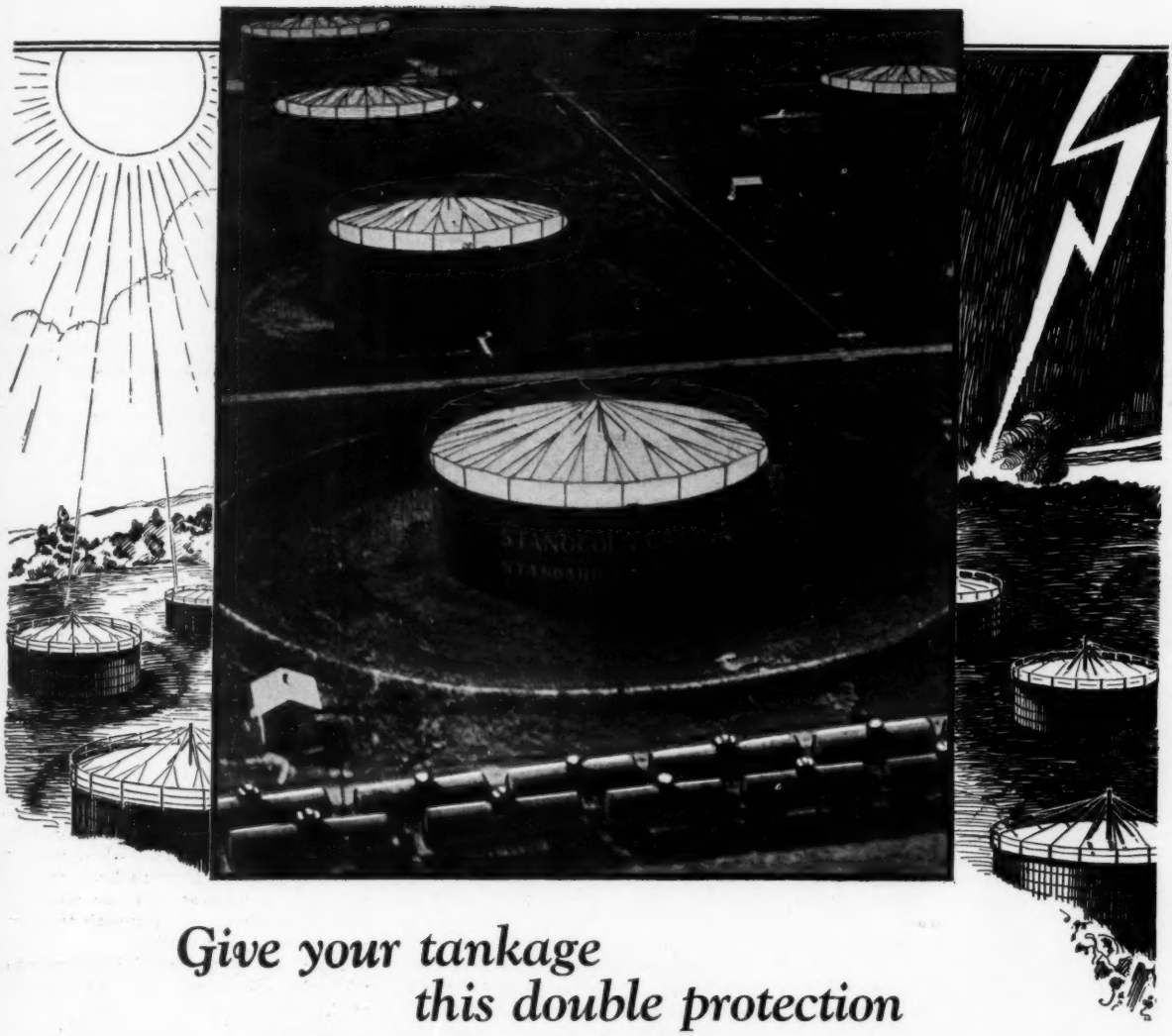

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JOHNS-MANVILLE Vapor Tight Insulated Tank Tops* with the Johns-Manville Grounded Conductor Network protect against both evaporation loss and lightning fires—the two natural enemies of tank storage.

Vapor Tight Insulated Tank Tops have already thoroughly demonstrated their economy on wood and steel deck tanks of millions of barrels total capacity.

The grounded conductor network is an effective protection against lightning fires due to secondary discharge on wood deck tanks. Complete information on request.

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count of his own carelessness will endanger fellow-employees.

7. The possession of or exercise by any employee of any habits, demeanor, characteristics, action or course of action that make him objectionable to other employees and the management or that makes his retention in the service disruptive of a spirit of harmony therein or would cause other employees to leave the service.

8. Changing working place without orders or prowling around the works away from assigned place.

9. Falsifying or refusing to give testimony when accidents are being investigated, or for false statements when application and physical examination is being made.

10. Neglect or carelessness resulting in damage to railroad equipment or neglect of car dropper to properly set brakes on railroad cars in his charge.

11. Willful neglect in care or use of company's property.

12. Obtaining material at storehouse or other assigned places on fraudulent orders.

13. Sleeping while on duty.

14. Offering or receiving money or other valuable consideration in exchange for a job, better working place or any change in working conditions.

15. Introduction, possession or use on the property of the company of intoxicating liquors.

16. Habitual use of habit-forming drugs or their introduction or possession on the property of the company.

In addition to the above, the Safety Division has issued to each employee a written notice specifying the men who must protect their eyes by wearing goggles when working in a place or under conditions whereby their eyes might possibly be injured. Whether or not an employee shall be discharged for failure to comply with the rules for the wearing of goggles rests with his foreman.

These particular rules as issued by the Safety Division are as follows:

Men Who Must Wear Goggles

1. All men using cutting tools, or using hammers, mauls, or sledges to strike metal tools.

2. Picking or chipping ice or frozen ground.

3. Chipping concrete or brick.

4. All men working on emery wheels at any time.

5. Boilermakers, riveters, caulkers, holders-on.

6. Men using rattlers on outside of pipe to remove scale, etc.

7. Welders and welder's helpers.

8. Pipe fitters on acid lines, caustic lines, ammonia lines and when cutting with cold cutter or breaking cast iron.

9. Acid works—every one working on acid pans, pumps, or lines; or when taking acid from containers, such as when taking acid samples.

10. Ammonia pump repair men and men in caustic soda houses.

11. Track laborers when cutting rail and cutting off bolts.

12. Teamsters and laborers when handling sludge.

13. Painters and laborers when scraping tanks, etc.

14. Boiler cleaners.

15. All men opening or closing acid valves or operating acid pumps.

16. Lead burners.

17. Men who are on any other work where the foremen designate that goggles shall be worn.

(Signed)

SAFETY DIVISION.

Each foreman, however, is also privileged to make such additional rules as he deems necessary either to increase the efficiency of the plant as a whole or the efficiency of the particular operation at which the workman is employed; or to improve the neatness and appearance either of the plant as a whole or of that particular part of the plant or equipment which the employee is most frequently in contact.

How the chief chemist of the Parco, Wyoming, refinery increased the efficiency, cleanliness and general appearance of the laboratory is shown by the following rules which were posted in a convenient place in the building:

To All Employees in the Laboratory

Effective this date the following rules will be effective as to the efficiency, cleanliness and general appearance of the laboratory and the handling of samples:

1. All drawers, cupboard doors, sliding doors to cases, etc., shall be kept closed at all times, except when opened for the specific purpose of taking something therefrom or placing something therein.

2. All samples or equipment to be tested or used on the following day shall be placed in orderly arrangement on the table, before the tester or chemist using same leaves for the day.

3. All samples of shipments, upon completion of tests on same, shall be placed on the north end of the sample table (near dumb waiter) to be put away by the sample boy in their proper place in the retain sample room.

4. All daily processing control samples shall be set to one side upon completion of tests on same, light oil samples to be placed on the south end of the sample table (near dumb waiter); heavy oil samples to be placed in bottom part of cupboard under lead-topped drain table in heavy oil testing laboratory—both light and heavy oil processing samples to be kept twenty-four hours before dumping.

5. All drain-tables (in light and heavy oil testing laboratory and chemical laboratory) shall have placed thereon only samples that may be dumped or apparatus that is to be cleaned. All tables are to be cleaned up by the sample boy before leaving for the day; that is, dumping samples and washing up glassware, etc., returning the washed glassware to the place designated by the tester or chemist who regularly uses same.

6. The floor shall be kept reasonably neat at all times. Burned matches should be placed in small receptacles placed at convenient places on the tables. Litharge, used in sealing corks, should not be thrown on the floor. Broken glassware, thermometers, broken asbestos boards, etc., shall not, deliberately, be thrown on the floor, and should be picked up immediately if accidentally dropped.

7. Whenever possible, so plan your work that the last five or ten minutes before quitting time shall be spent in cleaning up the table space at which you have worked during the day and putting in orderly arrangement such equipment as you may have been using.

8. Fix upon a definite place for equipment, glassware, etc., which you are using from time to time, and return it to that place after you no longer have use for it. You can keep laboratory tables orderly, without undue effort in doing so, or without being unusually or exceptionally "fussy" about the general appearance of the work tables.

9. If you are not scheduled to work Saturday afternoons, spend at least the last half hour of the morning in making a particular effort to clean up the laboratory, such as oiling the table tops, cleaning off window sills, washing the outside of bottles that have been exposed to the dust during the week, cleaning up sinks and drains, and, in general, doing whatever you deem necessary to maintain neatness and cleanliness in the laboratory at all times.

10. Keep as much of the less-frequently used equipment in cupboards as is consistent with the ease or difficulty of obtaining same when needed. Make a studied effort to keep the entire laboratory neat and orderly without materially interfering with the convenience of your work.

Your co-operation by complying with the above rules will be appreciated.

Failure in the compliance of same will be considered sufficient reason for discharge unless mitigating circumstances can be shown as to the reason for failing to comply therewith.

Chief Chemist.

Approved:

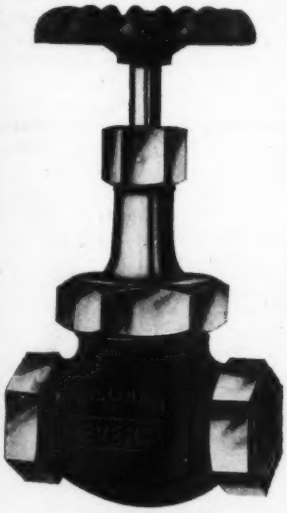
General Superintendent.

Different companies have slightly different rules and regulations governing the reasons for which an employee shall be discharged, and the above has been given primarily for the interest of the executives of the smaller companies who have no definitely established policies in this connection; while for the executives of the larger companies who have in force such policies, this article will permit a comparison to be drawn between their own rules and those rules which one particular company has in effect.

Throw out Repair Bills

Bills of that kind have one beneficial effect, at any rate. They make the shrewd executive think! From thinking to investigation is a short step. He wants to know the why—the reason for the bills. When found he can apply the brakes and stop them.

Ninety-nine times out of 100 the "why?" will be found in the valves. Originally these were chosen for their cheapness—the small initial outlay required for them.

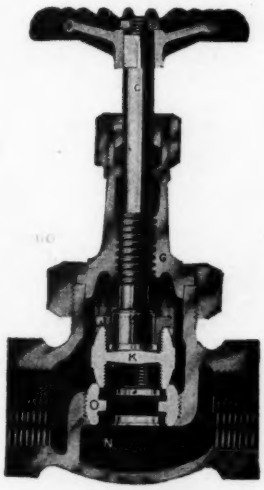


No. 780 REVERSO Valve
For 200 lbs. pressure and total temperature of 550° Fahr. A long lived valve which outlasts the ordinary valve on account of its higher seat vitality. Figured on the cost per year of leak tight service, it wins its way with the closest buyers. Reversible—Regrindable—Renewable, REVERSO has every element necessary to long life and low maintenance costs. Once in the line, the Reverso is there to stay—no more replacements or excessive upkeep expense—no wastage or production losses to drain away profits.
Order a sample from your dealer.

"Penny wise and pound foolish." Those cheap valves have proved terribly expensive. Under high pressures and temperatures they have collapsed and been repeatedly replaced. They have leaked and wasted steam steadily. They have caused numerous shutdowns and loss of production—to say nothing of much greater coal consumption.

The shrewd executive replaces his cheap valves with high-grade, and naturally chooses Williams Valves. He knows the Williams Company builds valves that last. That its product represents many years of experience in valve problems. That Williams Valves are dependable, durable and economical. That material and design qualify them for superior service. That they stop repair bills.

Abroad or at home—that is the story told of Williams Valves by all progressive plants. Why they have a world-wide reputation is described in our Catalogue 10. Write for a copy.



No. 780-S REVERSO Valve
Interior view of Reverse Valve. Note each detail—The wear-resisting, nickel alloy disc and seat—the reversible feature—the full free area—the union ring which secures hub to body and facilitates regrinding when necessary—the non-stripping stem which is gland packed and which is easily repacked under pressure when wide open. A non-heating wheel firmly lock-nutted to stem provides easy and comfortable operation.

The D. T. Williams Valve Co.

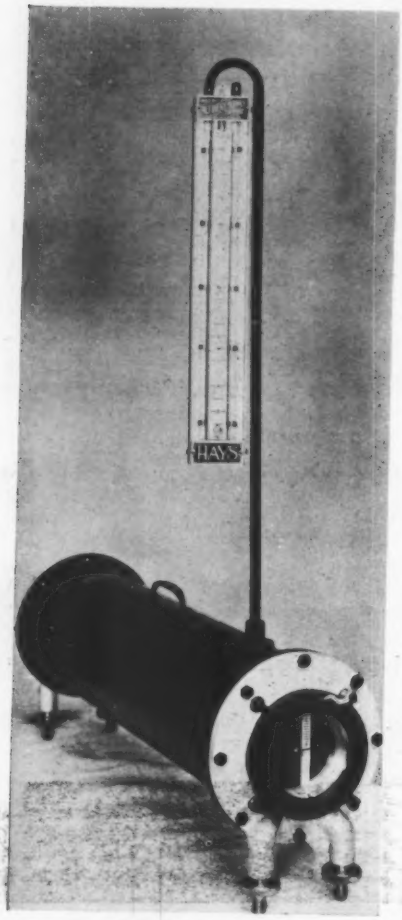
Cincinnati, Ohio

Makers of High Grade Bronze and Iron, Regrinding and Nickel Seat Stop and Check Valves, Gate, Blowoff, Hydraulic, Swing and Ball Check, Needle, Hose, Whistle Valves, Stop and Air Cocks, Unions, Fittings, Water Gauges, Gauge Cocks, Oil Gauges, Lubricators, Oil and Grease Cups, Steam Traps, Separators.

Williams Valves

Mention Where You Saw the Advertisement

RECENT ITEMS IN PLANT EQUIPMENT



R. S. "Nick of Time Portable Precision Specific gravity balance with mercury manometer attached.

Portable Gravity Balance Perfected by R. S. Company

The new R. S. "Nick of Time" Precision Specific Gravity Balance offered to the gas and gasoline industry by the Refinery Supply Company of Tulsa, Okla., and Dallas, Texas, has incorporated with it many features which, although new and novel, have been carefully checked and proven under the most exacting operating conditions.

While the instrument is accurate to the point of precision, and equal in performance to a fine laboratory balance, it is also strictly portable for field and other outside uses.

Portability is secured by clamping a plate over the pins on each end of the balancing member. These plates support the front member both front and back in a rigid manner and take all the strain from the torsion spring type of suspension.

Among the leading features of the balance is an improved type of torsion spring suspension and the provision for making adjustments without disturbing the instrument. The machine is balanced inside the case without removing the balancing mechanism.

The balancing screw is readily accessible by removing one hand cap on the front of the machine. Construction permits the easy adjustment of the center of gravity to a position above or below the theoretical center of gravity so gases of all characteristics may be handled.

An added feature of the machine is a provision for removing the purging tubes completely for the purpose of cleaning should the minute holes become stopped up with dirty water or dust.

The entire machine is lacquered inside and out to prevent corrosion. Some of the finer parts such as the torsion spring used for suspension and the truss wires running above the longitudinal members to offset the sag in the spring are gold plated to prevent action from acids.

Further information regarding the R. S. "Nick of Time" Precision Specific Gravity Balance may be obtained by addressing the Refinery Supply Company, the sole sales agents, Tulsa, Okla., or Dallas, Texas.

Cook Paint and Varnish Company in Houston

Houston, Texas.—The Cook Paint and Varnish Company of Kansas City have contracted for the purchase of the property formerly owned by the American Cotton Oil Company in Houston, Texas. This consists of a five acre tract of land served by two railways and improved by a three story and basement brick building 100 ft. by 100 ft. and oil tank storage totaling 350,000 gallons.

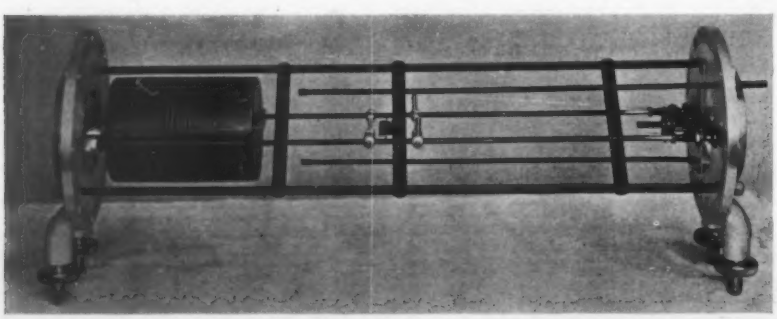
This property is within two miles of the business district of Houston, and is most conveniently situated to be served by all railway terminals and the ship channel.

The Cook Paint and Varnish Company have been looking forward to the establishment of a plant on the Gulf Coast and chose Houston for its location because of its security as an industrial center, its exceptional transportation facilities both rail and water, and its extensive tributary territory which is undergoing such rapid development.

The new property will be immediately remodeled and equipped to manufacture the complete line of Paints, Enamels and Varnishes. The installation will include the most modern paint manufacturing machinery and varnish stacks.

The management and personnel of the new division has not yet been announced, but they have stated that an aggressive sales organization would be built up to serve the industrial, painter and dealer trade of the Houston Territory.

The Cook Paint and Varnish Company, of which Charles H. Cook is President, is a concern known for its aggressiveness and conspicuous growth. In addition to its offices and plants in Kansas City, it has factories in St. Louis and Fort Worth and branches in Omaha, Denver, Dallas, Oklahoma City, Tulsa, Wichita, Chicago, St. Joseph and Kansas City, Kansas.



R. S. "Nick of Time" specific gravity balance with case removed to show method of construction.

High Pressure Float Is Made of Aluminum

Arthur Harris and Co., Chicago, are announcing to the engineering field a new float for high pressures. It is known as the Harris Super-Built and is made of aluminum. In certain engineering installations the float is used on liquids lighter than water that are under high pressures. This is specially true in oil refining. The high pressure float, therefore, must be of strong construction and light in weight.

It is claimed that under certain conditions copper is too heavy a metal to give both lightness and the necessary strength, and that the problem has been solved by the use of aluminum.

The new float is one-piece and is heavily nickel plated to prevent corrosion and give it a smooth surface. Tests have proven that the float may be used for pressures up to 1500 pounds per square inch. It is being made in 2½ to 12 inch sizes.

Further information may be secured from the company.

The Refinery Needs 'Em

Because They Are

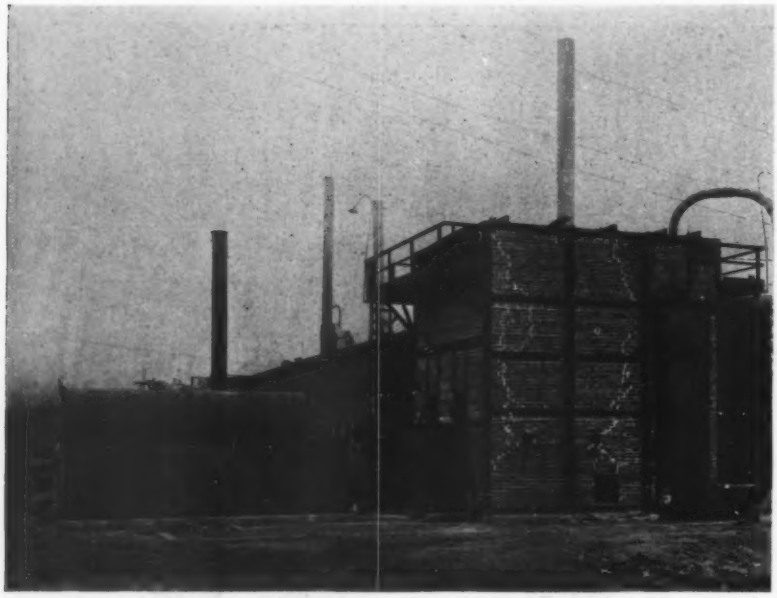
Vogt Drop Forged Steel Valves & Fittings

MORE and more refiners are coming to realize that there is only one dependable kind of valve and fitting made for their purpose. With various cracking processes involving extremely high pressures and temperatures, valves and fittings capable of withstanding these extremes are necessary. Refiners have learned that Vogt Drop Forged Steel Valves and Fittings fulfill their requirements completely, satisfactorily and safely. There is a type and size for every refinery requirement. Our latest catalog illustrates and describes them in detail. Write for your copy.

HENRY VOGT MACHINE CO.
INCORPORATED
LOUISVILLE, KY.

New York Chicago Philadelphia Cleveland Dallas

Manufacturers of: OIL REFINERY EQUIPMENT, DROP FORGED STEEL VALVES AND FITTINGS, WATER TUBE AND HORIZONTAL RETURN TUBULAR BOILERS, ICE MAKING AND REFRIGERATING MACHINERY.



Foster Tubular Oil Heater installed at an eastern refinery

Foster Tubular Oil Heater Heats Oil Properly

Heating oil to high temperatures has always been of the greatest interest to refiners, and the ultimate temperature together with the ultimate pressure may still require much research to determine.

Physical difficulties encountered for many years held back the experimentation with high temperatures and pressures, the chief difficulty being that of heating the oil to any considerable degree without at the same time overheating some portions of it.

During the past five years this stumbling block has definitely been removed and each year has seen an increase in the temperature applied commercially to oil in refining. Such temperatures as 700° and 800° F. were thought but a few years past to be hopeless commercially. There are now installations in regular operation heating the oil to 1100° F. These installations accomplish the task without difficulty, without overheating the oil and without damage to the heater. In addition to this they are efficient heaters and the loss in heat from the fuel burned is negligible.

The accompanying photograph shows a typical Tubular Oil Heater built without any baffles, but with tubes having cast-iron covering so graduated in exterior surface that the heat absorbed from the gases in the high temperature portion of the heater is relatively low, and the heat absorbed in the cooler portions of the heater is relatively high.

More information about this installation can be had from the Power Specialty Company, 111 Broadway, New York.

Plibrico Jointless Furnace Prevents Overheating

A type of furnace that is said to permanently prevent overheating and ultimate failure of the still bottom, by preventing the flame from impinging directly against the still bottom, and by diffusing the heat uniformly from the burner, is being recommended to the refining industry by Plibrico Jointless Firebrick Company, 1130-50 Clay Street, Chicago, Illinois.

Each furnace is equipped with two burners, one on each side. The oil is burned in combustion chambers of the "doghouse" type. No flame reaches the still bottom, once it is confined to and burned completely in the doghouses. The heat is diffused uniformly over the entire bottom of the still.

This type of furnace is adaptable to both old and new stills. Where old stills are being changed it is sometimes necessary to install a single "doghouse" in a narrow combustion chamber. The furnace can be used wherever stills are heated with oil or gas.

It is claimed by the manufacturer that the furnace, in addition to assuring long still life and accurate still control, assures complete combustion of the fuel oil or gas.

The furnace is built entirely of monolithic Plibrico Furnace Lining, a jointless refractory. It is pounded into place while plastic and has no joints.

Additional information may be had from the company on request.

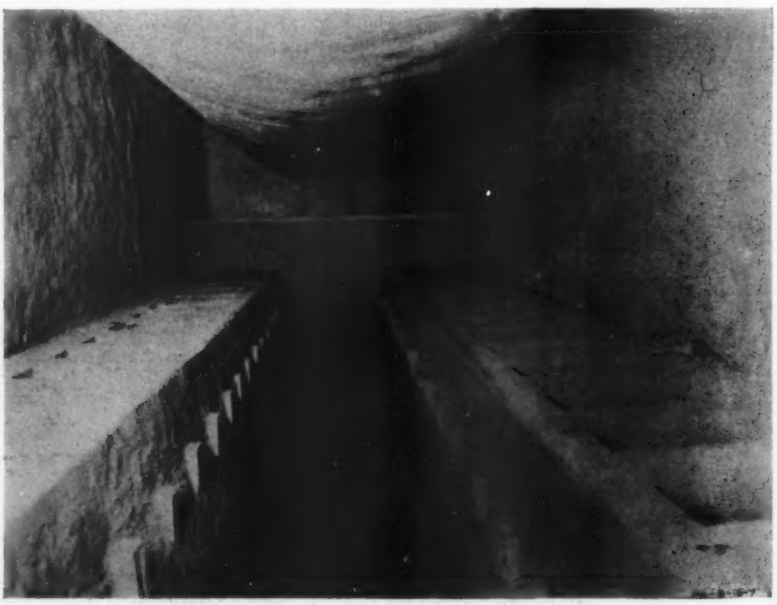
Alamo Refining Company Formed to Build Refining Plant in Panhandle

The first refinery to be built as a result of the recent development of the Panhandle field will be erected by the Alamo Refining Company, a Texas corporation, formed by Tulsa men, most of whom were former associates with the Waite Phillips Company.

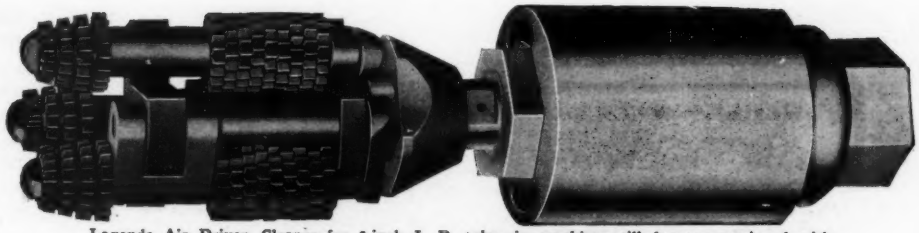
R. B. Pringle, former vice-president of the Waite Phillips Company, is president. M. P. Youker, superintendent of refineries of the Waite Phillips Company, is vice-president; while O. L. Cordell, a vice-president of the Waite Phillips Company in charge of refining and sales, is secretary and treasurer of the Alamo Refining Company. O. W. Crick, formerly with the Highway Oil & Refining Company of Tulsa, is assitant secretary and treasurer.

The concern has offices in the Security building in Tulsa.

The plant will be at end of the railway



Furnace lined with Plibrico Plastic cement



Lagonda Air Driven Cleaner for 3-inch I. D. tubes in cracking still furnace, equipped with long surface Quick Repair Head.

Lagonda No. D-153 Cleaner for 2-inch curved pipe, as used in the residuum lines.

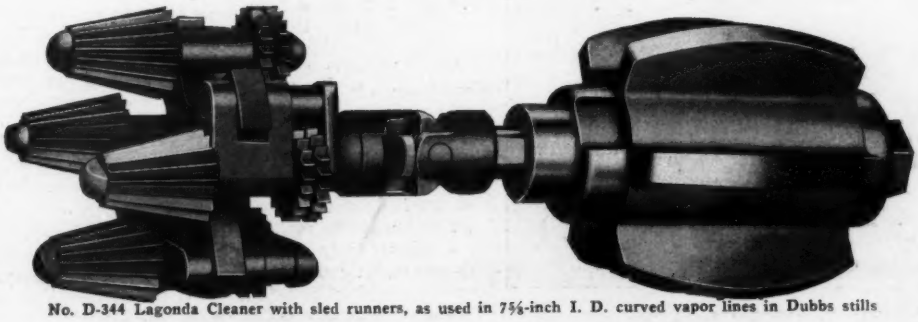
Lagonda Cleaners are at work in oil refineries everywhere, cleaning all sorts of tubes and pipes —large or small, straight or curved. They are furnished with air-driven motors and cutting head equipment to suit the purpose. Our experience in the application of tube cleaners to refinery work is at your service.

The Lagonda Mfg. Co.
SPRINGFIELD, OHIO.
FUEL SAVING SPECIALISTS
NEW YORK, CHICAGO, PHILADELPHIA, BOSTON, PITTSBURGH, CLEVELAND CINCINNATI, DETROIT, SYRACUSE, BALTIMORE
ST LOUIS, KANSAS CITY, DENVER, DALLAS, ATLANTA, SAN FRANCISCO, MONTREAL, LONDON.

Makers of Lagonda Boiler Tube and Condenser Cleaners, Tube Cutters, Cap and Header Reseating Machines, etc.

X-1415

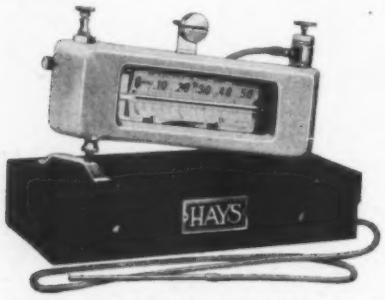
Extension piece used between Universal Joint and Drill, increases the cutting range of Drill in large size tubes.



No. D-344 Lagonda Cleaner with sled runners, as used in 7⅝-inch I. D. curved vapor lines in Dubbs stills

the Santa Fe is building from the town of Panhandle into Hutchinson County. The site is four miles north of Borger.

Considerable of the material already has been bought. The plant will be equipped with only pipe stills for distillation equipment. The decision to use these exclusively is the result of study in seeking methods for refining Panhandle crude oil. The plant should be in operation before winter.



Hays Portable Draft Gage, Mounted upon its case. Note method of leveling employing adjustable supporting foot. The knurled screw permits the draft gage to be hung from the wall when required. Zero adjustment is effected by sliding the scale to proper position.

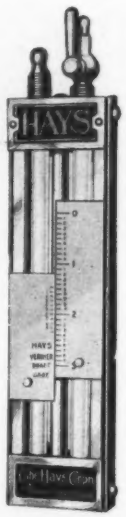
Portable Testing Outfit for Engineers

A testing outfit especially designed for service men, combustion engineers and others interested in the quick determination of combustion efficiency and the cause and location of boiler trouble, has been placed upon the market by the Hays Corporation of Michigan City, Ind.

The Hays testing outfit consists of a portable flue-gas analyzer, a steel armored flue-gas thermometer, and a draft gage, all compactly arranged in a light case convenient for use. The gas analyzer is the standard Hays gas analyzer for determineing CO_2 and also if desired, carbon monoxide and oxygen. The draft gage is of the adjustable inclined-tube type and measures 9 inches in length and 4 inches in height; the range is one-half inch of water, either draft or pressure, graduated in hundredths.

The draft gage is self-contained in a pocket case, and the metal doors of the analyzer, when closed, encase it effectively. Either one can be carried or used independently of the other. Both the draft gage and the analyzer can, however, be placed in the carrying case for immediate transport from one location to another. This case measures only 4x14x18 inches and can be slipped into an automobile or underneath the seat of a train. The combined weight is less than 20 pounds.

With this testing kit it is possible to make a complete check of the efficiency for combustion—flue-gas analysis, draft at various points and temperature of waste gases. by means of this outfit, service men are quickly able to adjust regulators, dampers, etc., so as to minimize "excess air," maintain high CO_2, reduce stack losses and clear up leaky settings, broken baffles, cracks, etc. Detailed operating instructions are furnished.



Hays Vernier Draft Gage. Inches and tenths are read on the right hand scale while hundredths are shown on the left hand scale where two lines coincide. The reading here is 1.46"

These testing outfits are rugged and strong, and are entirely self-contained. All extraneous equipment has been done away with. There is room in the case for a screw driver, wrench, or any special tools, as well as a pair of "jeans" or "coveralls."

The Hays Portable Draft Gage is made of polished cast aluminum and has been especially designed for portability. Weighing only 1¾ pounds complete with case, and measuring only 4x9x1¼-inches it can be slipped into the pocket or carried anywhere. The scale has a range of one-half inch water and is calibrated to read in hundredths of an inch or in millimeters.

The straight glass indicating tube is held without strain by means of compression nuts and special cork washers, one end of the tube connecting with an accurately machined brass oil chamber and the other with a brass vent. Liability of breakage is thus overcome.

The Hays Portable Draft Gage possesses a number of refinements which will appeal particularly to those making tests under varying conditions. A removeable and adjustable supporting foot is provided for leveling the gage quickly on box, shelf, table or any flat surface. If preferred the gage may be mounted on a wall, using the knurled screw which is furnished. The movable scale facilitates zero adjustment. A needle valve locks the oil in the oil well so that the gage may be carried in any position and quicky placed in service. The case is of such size that the gage cannot be inserted until this needle valve has been closed—making it foolproof.

For making tests where more than one-half-inch of draft or pressure is encountered the Hays Vernier Gage is very useful. This gage is constructed on the "U" tube principle and is furnished with very accurate slidable vernier scales which permit readings to the hundredth of an inch of water. The indicating fluid is water and the range, using the vernier scales, is 3-inch draft, pressure or differential draft or pressure. On the reverse side of this gage there is a second scale of the standard U-Tube or Manometer type which gives the gage a range of six inches with divisions in tenths.

Instantaneous snap-shot readings of draft or pressure can be taken at any spot desired and without setting up or leveling. The cock which is provided makes it possible to make a test in a dark cramped, or hot corner and carry the gage to a more comfortable place where the light is good to take note of the trapped reading.

More information can be had from The Hays Corporation, Michigan City, Indiana.

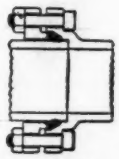
Hays Portable Test Set

George D. Durham has been appointed superintendent of the Fort Worth plant of the White Eagle Oil & Refining Company. Before taking this post, he was assistant superintendent at the August plant of this concern. Previously he had been with the White Eagle Company at Casper when that plant was under construction. Other experience includes some time spent with the Producers and Refiners Corporation at Parco, Wyoming.

Arthur W. Sullivan has been promoted in the Tide Water organization, now being general manager of the Tide Water Oil Sales Corporation, headquarters New York. Previously he was advertising manager of both the Sales Corporation and the Tide Water Oil Company. This last position has been taken over by William C. Gittinger, former assistant to Mr. Sullivan as sales development and advertising manager.

Before joining the Tide Water company, Mr. Sullivan was with the advertising firm of Joseph Richards Company, Inc., and later advertising manager of the Vacuum Oil Company.

SIMPLEX CAST IRON CONDENSER PIPING



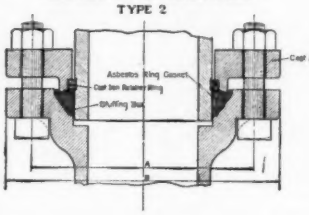
"ONE FLANGE IS LOOSE"

Settles the Rust Question

Progressive refineries now secure the durability of cast iron pipe in their condenser coils without the disadvantage of standard flanged pipe construction. Our Simplex joint, using a triangular shaped, endless asbestos gasket, is the secret. It is fully described and illustrated in our Catalog No. 55. Your copy is ready to be mailed upon receipt of your request.

Do you know why cast iron resists corrosion so much more than other ferrous metals? Our Bulletin No. 44 explains it.

CROSS SECTION OF ASSEMBLED JOINT
SIMPLEX CONDENSER PIPING
TYPE 2



Dimensions A and B are American Standard for 125 lbs. pressure

AREA PER LINEAR FOOT

SIZE	CLASS	INSIDE SQ. FT.	OUTSIDE SQ. FT.
4"	AB	.67854	.16275
	CD	-	.16475
6"	AB	.16472	.19400
	CD	-	.19588
8"	AB	.13798	.1895c
	CD	-	.18978
10"	AB	.34844	.13660
	CD	-	.36640
12"	AB	.26320	.28100
	CD	-	.29048
15"	AB	.34418	.36695
	CD	-	.38488

Write for Simplex Condenser Catalog Number 55

AMERICAN CAST IRON PIPE COMPANY

General Offices and Foundry: Birmingham, Ala.

Branches at
Dallas, Kansas City, San Francisco, Los Angeles, Chicago, New York,

Write Also for information on Our Prepared Joint Cast Iron Pipe for Oil Lines

EXTRACTS OF REFINING TECHNOLOGY

Bergin Benzine and Bergin Oil.—A mixture of one hundred kilograms of Italian lignite with 67 kilograms of topped coal tar and four kilograms of "LUX" material was "berginized" in a fifty liter bomb by the continuous method, with the addition of five kilograms of hydrogen. The finely ground lignite was mixed with the tar to form a paste. The lignite contained 13.8 per cent of water, 8.45 per cent of ash, and 0.08 per cent of sulphur. Hydrogenation took place at a temperature of 470 degrees S under a pressure of 140 to 150 atmospheres.

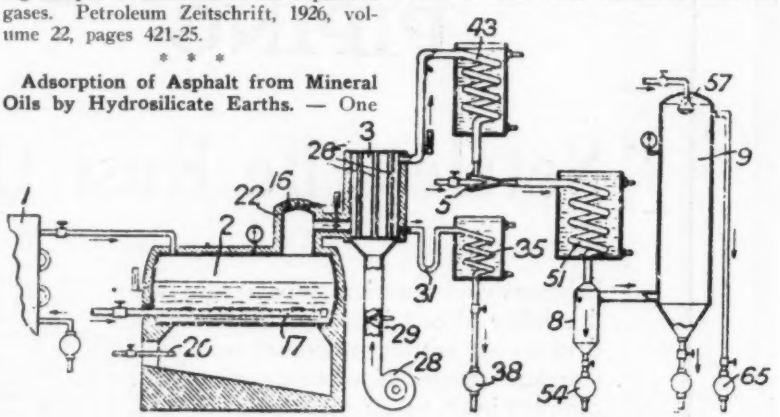
The expansion gases were freed from benzine by activated charcoal, yielding eight kilograms of benzine. Twenty kilograms of gas were formed and 139 kilograms of "runnings," and the loss was nine per cent. The benzine was water-white, had an odor of petroleum benzine and a density of 0.7303. 74.6 per cent distilled over from 50 to 120 degrees C. and the benzine was easily refined. The relation between boiling point range and density corresponded to that of American benzine. The lower fraction obtained by distilling the "runnings" had a density of 0.990 and contained 12.5 per cent of phenols, being similar to a low temperature tar oil. The wax content was one per cent to one and one half per cent.

The residue was very viscous, and on redistilling 47 per cent of hard asphalt remained, indicating a total asphalt content of about sixty per cent, but the ash content was small. A third fraction of the "runnings" consisted of water (29.5 kilograms) containing 7.83 grams of ammonia per liter. This only corresponded to nineteen per cent of the total nitrogen present in the raw material, the rest having escaped as ammonia in the expansion gases. Petroleum Zeitschrift, 1926, volume 22, pages 421-25.

* * *

Adsorption of Asphalt from Mineral Oils by Hydrosilicate Earths. — One thousand grams of residue from kerosene distillation were diluted with two hundred and fifty grams of kerosene. The mixture had an asphalt content of eight per cent, and was filtered through a layer of mixed powdered and granular "Silit," fifteen centimeters thick, weighing 580 grams at a temperature of 60 degrees C. After 48 hours filtrate commenced to pass, and 95 grams were collected in a further 48 hours, being light-yellow and free from asphalt.

A second fraction, 65 grams free from asphalt, was collected, and after three days a further 150 grams, dark in color, and containing seven per cent of asphalt. Thus a "Silit" was exhausted after adsorbing only 2.5 per cent of its weight of asphalt. The first fraction of filtrate was of slightly lower density than the



Quigley Refractory Gun

This Gun shoots premixed refractory mixtures such as Hytempite and aggregates with high velocity at any place in walls or arches of furnaces, also fills cracks, restores burned out walls or surfaces new ones, repairs or builds baffles, patches retorts, kilns, etc.

Quigley Refractory Gun, Type P. A.

Saved $2800 in Two Months

One large company, using the Quigley Refractory Gun to apply refractory mixtures to the arches, side walls, fire walls and bridge walls in 7 of their boilers, writes that they couldn't get a good job until they tried the Gun—and then—they not only got a much better job, but they saved $400.00 net per boiler after two months use.

The Quigley Gun can also be used to spray Stucco, Plaster, Whitewash, Paint, etc. Operates by compressed air. Booklet RG130R tells you how.

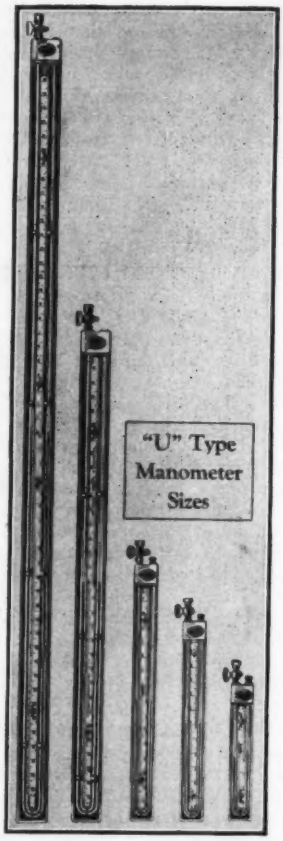
Spraying Hytempite Mixture with Quigley Refractory Gun

Quigley Furnace Specialties Co., Inc.

26 Cortlandt Street New York City

Makers of ***HYTEMPITE***

Distributors with stock and service in every Oil Field and Industrial Center



MERIAM
"U" TYPE MANOMETERS

ACCURATE—Cannot be otherwise as their indicating medium is affected only by force of gravity.

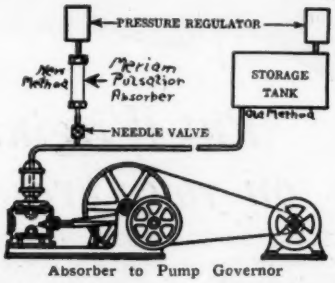
DURABLE—Frames cast in one piece aluminum. Projecting sides and raised center protect heavy walled glass "U" Tube secured within this recess.

ADAPTABLE—Used in any business when a true measure of pressure or vacuum is required. Used to calibrate Recording Meters. Used as Portable Gauges.

SERVICE—All sizes carried in stock at Tulsa and at Dallas.

also manufacturers of Well Type Manometers and Special Manometers for High Working Pressures

PULSATION SHOCK ABSORBERS



Absorber to Pump Governor

Meriam Pulsation Shock Absorbers absorb the surge of pressure to Gauge, Pump Governor, Regulator or Recorder. Fitted with different retardance to meet varying conditions.

Keep Gauges accurate and save repair. Allow Pump Governors or Regulators to work smoothly without being affected by a jerky pressure. Provide uniform pen lines easily followed by a planimeter.

Save Annoyance, Inaccurate Readings and Repair Bills.

INDICATING FLOW METERS

Type "C" Indicating Flow Meter

Used where accurate knowledge of the rate of flow is necessary. Used for a permanent check on the accuracy of any Recording meter. Type "C," Gland Packed, used with working pressures up to 1000 pounds. Used with Gas or Air or any liquid at any temperature.

Fitted with safety overflow mercury device.

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succeeding fractions. Petroleum Zeitschrift, 1926, volume 22, page 424.

* * *

Distilling Hydrocarbon Oils.—Lubricating oils are obtained by distilling in the presence of steam and under pressure of approximately five millimeters of mercury, petroleum products, preferably those from which fractions boiling below 600 degrees F. at ordinary pressures have been removed. The vapors are cooled to separate lubricating oils and are increased in pressure by a steam jet ejector prior to condensation of the steam.

As shown in the accompanying illustration, a still 2 heated by a burner 20 is supplied with preheated oil from a tubular heater 1 and with steam from a perforated pipe 17. The vapors pass from a dome 16 covered with heat insulating material 22 to a condenser 3 which is cooled by the passage of air from a pump 28 through a valve 29 and through tubes 26. The condensate passes through a seal pipe 31 and cooling coil 35 and is withdrawn by a pump 38. Uncondensed vapors pass through a water-cooled coil 43, and are forced at increased pressure by a steam jet ejector 5 into a condenser 51 from which condensate passes into a separator 8 and is withdrawn by a pump 54 and steam and other uncondensed vapors pass into a condenser 9 which is evacuated by means of an air pump 65 and supplied with condensing water from a rose 57. British patent No. 251,928.

* * *

Oxidation of Mineral Oils.—The subject of oxidation of mineral oils to give fatty acids is a very interesting one and it will be remembered that it attained considerable importance during the war, as affording the Germans a source of fatty acids for soap making. The literature on this subject is reviewed in Seifenseider Zeitung, volume 53, pages 280-281. It is also indicated in this article that in the oxidation of mineral oils in addition to the paraffin and naphthene acids, unsaturated hydrocarbons are also formed.

* * *

Emulsifying Powers of Sodium Stearate and Sodium Palmitate.—Tests have been made to determine the emulsifying powers of sodium stearate and sodium palmitate by establishing the least quantity of the soap that will just emulsify definite volumes of certain oils. As the purity of the soaps considerably influenced their emulsifying powers, they were carefully prepared by neutralization of a solution of the acid in alcohol with the aid of sodium carbonate, evaporation to dryness and extraction of the dried mass with alcohol. It was found that sodium stearate, and that the soap solution having the lowest surface tension was the best emulsifying agent. Emulsifying power also increased with concentration of the soap solution. Kolloid Zeitung, volume 37, pages 139-144.

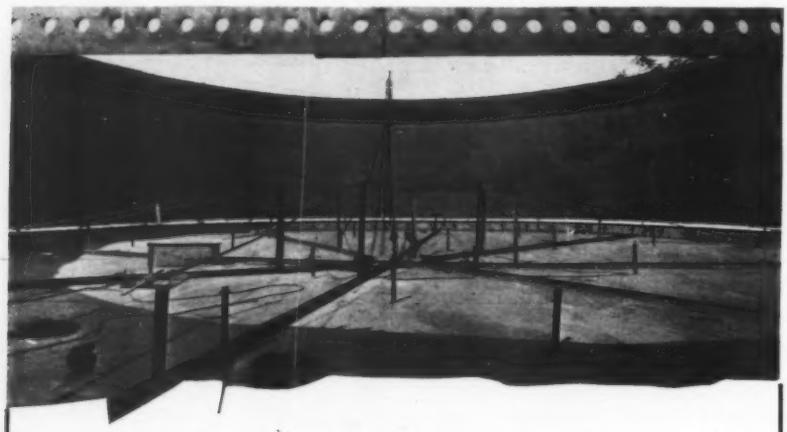
* * *

Tetralin for Extraction of Oil Shales.—Comparative investigations, which were carried out on various extracting media, such as benzine, chloroform, decalin and tetralin, have shown that the latter is by far the most effective solvent for the oil that is contained in shale. The solvent is employed at a temperature at which there is no decomposition of the bituminous matter, which is approximately 250 degrees C. For further details see Brennstoffchemie, volume 7, pages 149-53; 181-5.

* * *

Composition and Actual Value of a Benzine.—It is indicated that the value of various methods which are employed in the testing of benzine varies very considerably. The determination of the density and of the index refraction is of no value at all. The distillation curve is however an important determination, and this also applies to the nature of the composition of the benzine, that is the proportion of saturated aliphatic, cyclic and aromatic compounds in it. This composition can be determined with sufficient accuracy for all commercial purposes in accordance with the method in which the critical solution temperature of the benzine in aniline is established.

Furthermore tests which have for their purpose the determination of the sulphur content, the water, heavy oil and acidity are also important. The calculation of the thermal value of the benzine, which can be established to an accuracy of five per cent, is carried out in accordance with the following formula:—$P_v = 101.\ ar + 112.\ c + 113.\ e + 115.\ ac$. In this formula ar denotes the percentage of aromatic hydrocarbons in the benzine, c the percentage of saturated cyclic hydrocarbons present, e, the percentage of unsaturated hydrocarbons present (expressed in terms



Put Wiggins Roofs on your present tanks

WIGGINS ROOFS practically eliminate evaporation. Your present tanks can be equipped with them to minimize all evaporation losses and protect your storage against fire.

Wiggins Roofs are installed on your present tanks in the following manner. The customer empties and cleans the tanks. The old coverings are taken off and a stiffening girder is put around the top of each tank, if necessary. The roofs are then completely erected at the bottom of the tanks, ready for operation when the tanks are filled. In the installation shown in the photograph above, a plate has been taken out to permit the passage of material to the workmen.

The gastight, fire-safe seal and steel deck of the Wiggins Roof cover the oil surface. The only vapor space is in the gastight seal. It is reduced to a negligible volume. There is no splash-over. Fire cannot reach the oil.

Wiggins Roofs are built for any size or type of steel storage tank. Where a complete new installation of small tanks and roofs is made the tanks are welded (when permissible) to make them perfectly smooth inside. On your present 55,000-barrel tanks Wiggins Roofs will lose only 10 per cent of the loss with a standard gastight roof.

Let us send you complete information on the most thorough means of eliminating evaporation losses and protecting your storage from fire.

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Chicago, 2463 Old Colony Bldg.
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Cleveland, 2234 Union Trust Bldg.
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Atlanta, 1046 Healey Bldg.
San Francisco, 1051 Rialto Bldg.

WIGGINS ROOF

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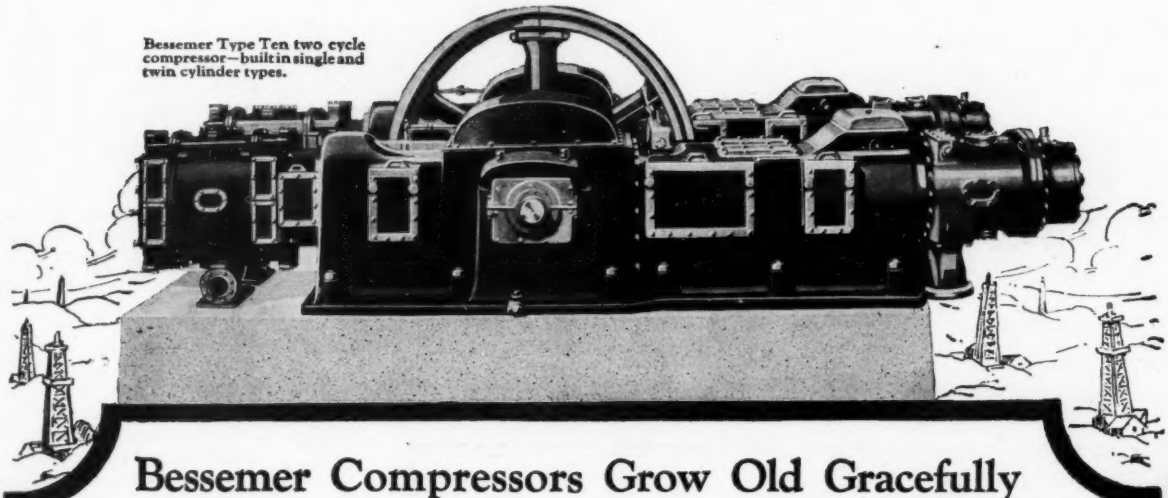

Bessemer Type Ten two cycle compressor—built in single and twin cylinder types.

Bessemer Compressors Grow Old Gracefully

SEASONS may come and seasons may go, but a Bessemer Compressor keeps on and on. Time touches them but lightly.

Why do these Bessemers outwork and outlast other similar equipment? Simply because they are built to do just that—there's no skimping any place. Every part has been designed and built to wear for years. Every bearing has an oversize surface to minimize wear. Every moving part is built oversize and overstrength to withstand hard service. The parts which receive the most wear have been made easily adjustable to reduce unproductive time to a minimum. The bed plates are unusually rugged to withstand the vibration of years and years of service.

The strain and stress on every casting, forging, bearing, bushing, gear, bolt and nut has been carefully predetermined and *then built amply oversize to assure "service without servicing."*

A Bessemer Compressor (either two cycle or four cycle) is the compressor that can be depended upon not only for *more years* of service, but for *greater operating efficiency* and *lower maintenance expense* during those years of service.

THE BESSEMER GAS ENGINE COMPANY

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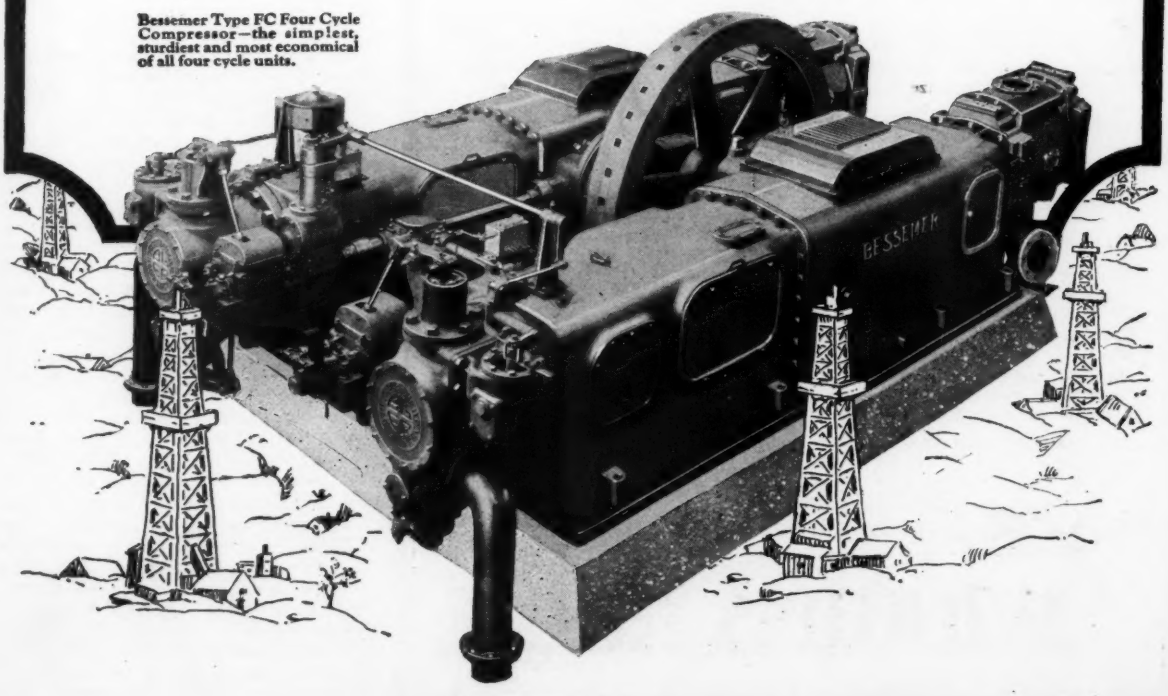


Bessemer Type FC Four Cycle Compressor—the simplest, sturdiest and most economical of all four cycle units.

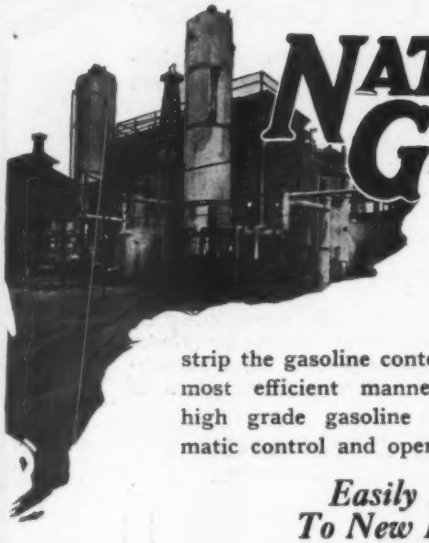
of amylene) and ac the percentage of saturated aliphatic hydrocarbons present. Bull. Federation Industr. Chem. de Belgique, 1925, pages 594-602.

* * *

Distilling Petroleum With Gases.—A gas was conducted through a mass of four hundred cubic centimeters of benzine-free petroleum at a temperature of 250 (this is the temperature of the oil bath). The gas was led through the crude oil at the speed of 0.02 liters per second, and this was continued until 80 cubic centimeters had distilled over. Thereafter the rapidity of the stream of gas was raised to 0.05 liter per second until an additional 21.5 cubic centimeters had distilled over. The distillation in a current of illuminating gas (density 0.47 of that of air) lasted thirty-three to thirty-four minutes and the density of the distillate was 0.83125 at 15 degrees C., the flame temperature 38.5 degrees C., the iodine number 2.6.

When the distillation was carried out in air, the process lasted twenty minutes and the density of the distillate was 0.8327 at 15 degrees C., the flame temperature 42 degrees C. and the iodine number 2.7. The distillation in a current of carbon dioxide lasted eighteen minutes. The density of the distillate was 0.8318 at 15 degrees C., the flame temperature 39.5 degrees C. and the iodine number 2.25. A distillation was also carried out with the aid of hydrogen gas and this lasted seventy minutes, the density of the distillate being 0.8312 at 15 degrees C., the flame temperature 39.5 degrees C. and the iodine number 2.39.

As may be seen, the distillate which was obtained with the aid of carbon dioxide was poorest in unsaturated hydrocarbons, and the conclusion is that in this distillation the crude oil was subjected to the least decomposition. The duration of the distillation in various gases was seen to be inversely proportional to the square root of the density of the gas. However it has been found that the rate of distillation varies during the test with a certain gas and that in the first few minutes of distillation it does not matter which gas is being used, as the quantity of distillate is constant in all cases. Neftjanoe Chozjajstwo, volume 10, pages 236-42.



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"Southwestern" Portable Absorption Plants will handle the natural gas from producing wells, and strip the gasoline content from the gas in the most efficient manner possible, producing high grade gasoline with practically automatic control and operation.

Easily Moved To New Locations

The "Southwestern" is a portable plant, having all the advantages of standard stationary installations, plus the additional values of absolute portability. More than 250,000 gallons of gasoline are being produced daily in "Southwestern" Portable Absorption Plants . . . . a fact which merits your careful consideration.

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Complete Refineries
Gasoline Absorption Plants
Power and Industrial Plants

"SOUTHWESTERN" PORTABLE ABSORPTION PLANTS

"First in the Field and Far in the Lead."

Refining Oil With Caustic Soda and Sulphur Acid

(Continued form page 26.)

It is also found advisable at times to finish up the acid treatment with another quantity of ordinary acid after oleum has been used. There are of course certain special oils, such as Russian oil, high grade electrical oils, which must be refined with oleum. It is said that chrome salt containing acid will have the same effect as oleum.

Proportion Desired

Another important consideration in the acid refining process is the quantity of acid employed. Tests have shown that as the proportion of acid used increases up to a certain amount, the color of the refined product improves but when the proportion of acid has reached a certain maximum, further additions of acid are productive of bad results. The determination of the quality of a refined oil by its color has been superseded in part by the determination of its tarring coefficient and its tendency to form a scum after oxidation.

The duration and the character of the mixing of oil with sulphuric acid are also important considerations. The time of mixing must be an hour in most cases, and the mixing itself is accomplished with mechanical agitators or with a blast of air.

From the chemical standpoint mixing with the aid of mechanical stirrers is much to be preferred, for the reason that the current of air that is blown through the mass of oil and sulphuric acid is apt to oxidize the constituents of the oil and thus cause large losses of oil values. Furthermore the use of air agitation also has the effect of producing compounds which later give rise to emulsions. Then again the moisture in the air will always dilute the acid, which is another disadvantage. Air also has the power to distill over the light ingredients of the oil and thus entail further losses.

The cheapness and easy regulation and maintenance of the process have however served to make it popular. However it is being replaced by the mechanical agitating process. In fact processes are being perfected (See United States Patent No. 1,404,389) in which the refining is carried out in absence of air in agitators provided with water-cooled stirrers. Then

JENKINS CRACKING PROCESS

PRODUCES QUALITY GASOLINE

Facts from performance

EXPECTATIONS

Naturally, every user of the Jenkins Process expected certain results when he purchased the equipment.

These expectations have been more than fulfilled in every respect —

Quantity of gasoline produced
Longer operating cycle
Low fuel consumption
High liquid recovery
Quality of gasoline
Ease of operation
High conversion
Throughput
Low loss.

■

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again another process (see German Patent No. 412054) is carried out in an atmosphere of an indifferent gas, such as, nitrogen, carbon dioxide and the like. This not only has the effect of preventing the oxygen in the air from getting at the oil, but also removes a large part of the oxygen that is dissolved in the oil itself.

The newest improvement along these lines is the continuous refining process and certain important references to literature and patents on this subject will be found in Technische Fortschrittsberichte, volume VII, Mineraloele, 1925, page 64.

Settling

Considerable attention has also been paid to the design of devices which would accelerate the settling of the acid. Various substances such as sand, flour or the like have been added to aid the acid settling. The addition of one per cent of Oleic acid has been recommended, United States Patent No. 1,521,283 tells of a process in which settling is aided by the treatment of the oil, after it has been refined with ordinary sulphuric acid, with four to twenty-five per cent of fuming sulphuric acid. In other processes the acid resins are removed from the treated oil by means of centrifuges. (See British Patent 193,-099 and United States Patent No. 1,565,-016). According to United States Patent No. 1,523,077, the oil is centrifuged after such substances as alkaoi, alcohol, acetone and benzol are added to it which have the effect of facilitating the removal of the acid resins. Filtration through diatomaceous earths is also recommended for the removal of the colloidal asphalt. (See United States Patent No. 1,506,115.)

Another important factor in the refining of mineral oils is the intrinsic character of the oil iself. It is understandable that certain oils contain less impurities than others and require but little sulphuric acid for their refination. Others, on the other hand, contain large amounts of unsaturated compounds and asphalt and are difficult to refine. It is thus better to distill the oil and then to refine the distillate than to try to refine the original oil. This is a procedure which is followed out in the case of white oils, for if this were not done, the losses of oil values would be very high.

There have been many patents issued on special processes for oil refining. A few will be mentioned here. German Patent No. 419,302, for example, describes a process in which the hydrocarbon vapors are led over pumice impregnated with sulphuric acid. According to British Patent No. 213,881 the oil is simultaneously refined with sulphuric acid and clay. Another process consists in the heating of crude oil with aqueous sulphuric acid or with sulphonated aromatic hydrocarbons at high temperatures and the product is then distilled. This is described in German Patent No. 388,547. In French Patent No. 544,823 the mineral oils are treated with sulphuric acid while being stirred and then with fuming acid. Water is thereafter added, the mixture is allowed to settle, the oil is separated from the acid and finally washed with water. The acid treatment is then repeated, and mineral oils that contained fatty or naphthenic acids are washed with alkali.

Power Piping
FOR EVERY OIL FIELD NEED

Welded Work

Here is shown an aerial condenser fabricated for the Craig Oil Co. of Teledo, Ohio, illustrating how well this company can serve where special welded work is required. Write us your requirements.

POWER PIPING COMPANY
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BECO Baffle Wall Assures Number of Savings

A strip of corrugated sheet metal is the feature of a new baffle wall that is being marketed by the Boiler Engineering Company, 760 Broad Street, Newark, New Jersey. This wall is known as the "BECO Baffle Wall."

A continuous strip of corrugated sheet metal in each diagonal alley of horizontal water tube boilers separates the plastic refractory material into layers.

This assures flexibility. The corrugated joint has a low coefficient of friction and does not resist expansion or contraction.

The corrugated joint is said to be a perfect sliding fit and the tubes are completely mortared into the plastic layers.

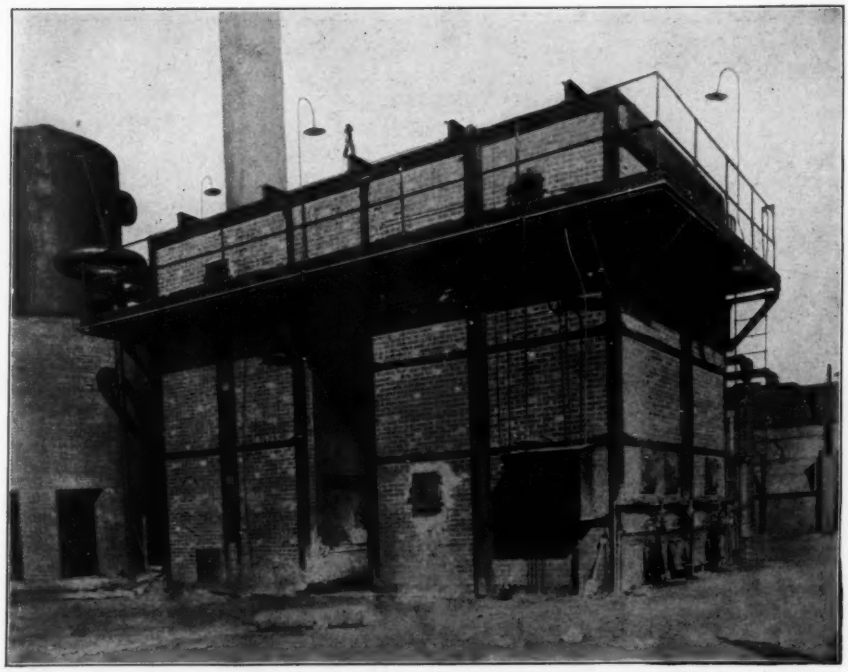
BECO baffles may be installed at any desired angle and are applicable to any water tube boiler, horizontal or vertical.

Manufacturers of this baffle claim that furnace lining repairs are reduced materially because of the increased furnace volume created by the inclined baffle.

Additional information will be supplied by the company.

FOSTER

TUBE STILLS



OVER 500 Foster Tube Stills are operating with a high degree of efficiency in topping crude oil, re-running distillates, recovering light oils, continuous distillation, distilling crude coal tar, cracking, producing lubricating stock, preheating cooling oil vapor, heating asphalt, refining vegetable oils, and many other industrial oil heating operations.

POWER SPECIALTY COMPANY

111 BROADWAY, NEW YORK

Branches in All Oil Centers

Refiners' Problems in Making Stoddard Cleaning Solvent

(Continued from page 38)

cleaning solvents do not quite agree with Mr. Jackson's views; however, Mr. Jackson's comments and those of the Cleaners' Association in regard to flash point have been given, primarily, in order to show this lack of agreement.

Mention will be made again of this relationship in discussing the results of laboratory experimental work conducted by the writer in making Stoddard Solvent.

Experimental Work

Laboratory Hempel distillation tests were made on a number of different, incompletely-refined refinery products, and yield calculations and a few physical tests then were obtained on those fractions that met the distillation range specification for Stoddard Solvent.

The products upon which a Hempel distillation test were made, in order to obtain a maximum yield of Stoddard Solvent, were as follows:

1. Composite sample of gasoline from Lost Soldier crude oil.

2. Composite sample of re-run distillate obtained both from the primary distillation of Lost Soldier crude oil and from the re-running of pressure distillate.

3. Sample of pressure distillate re-run, which represents approximately 70 per cent of the raw pressure distillate when the latter is subjected to a double distillation.

4. Treated pressure distillate.

5. Re-run distillate from Salt Creek crude oil—said re-run distillate representing the whole of a 50 per cent overhead cut from the crude.

6. Sample of gasoline from the first stream of a battery of crude stills operating continuously on Lost Soldier crure oil—this stream representing 7 per cent gasoline content of the crude oil.

The results of the laboratory distillation tests on the above-mentioned samples, and some of the tests on the Stoddard Solvent obtained therefrom, are shown immediately following:

1. Hempel Distillation of Composite Sample of Lost Soldier Crude Gasoline

(14% of Crude)

Gravity of Charge 48.2

Yields

Over to 310 degrees F.....	63.9%
310-370 degrees	21.6%
Bottoms	13.1%
Loss	1.4%
	100.0%

Distillation Test on Naphtha Cut

(Stoddard Solvent)

		Temp. Off	Per Cent Oil
Gravity	42.2		
Initial Boiling Point	310		
10	317		
20	322		
30	326		
40	330		
50	334		
60	338		
70	344		
80	353	380	96.0
90	365	392	98.0
92	368		
95	376		
97	383		
Maximum	401		
Color	Plus 25		

Flash Tag-Open Cup.....110°F.
Fire Tag Open Cup.....125°F.

Yields:

Per cent of Stoddard Solvent from Lost Soldier crude oil—based on results of laboratory Hempel distillation test 0.14x21.6 equals 3.0.

Per cent of Stoddard Solvent from Lost Soldier crude oil that would be obtained in plant—discounting laboratory yield 33-1/3% equals 2.0.

2. Hempel Distillation of composite sample from re-run distillate. (5% of combined Crude and Pressure Distillate.)

Gravity of Charge 38.2

Yields

Over to 308° F.	2.7%
308-363° F.	13.5%
Bottoms	82.2%
Loss	0.6%
	100.0%

Distillation Test on Naphtha Cut

Gravity 44.7	
Initial Boiling Point 294	
10 308	
20 314	
30 319	
40 325	
50 330	
60 336	
70 342	
80 352	
90 366	
92 372	
95 382	
97 394	
Maximum 397	
Color . . ..Plus 20	
Flash Tag-Open Cup	105° F.
Fire Tag-Open Cup.....	120° F.

Yields

Per cent of Stoddard Solvent from re-run distillate—based on results of laboratory Hempel distillation tests—0.05x13.5 equals 0.70.

Per cent of Stoddard Solvent from re-run distillate that would be obtained in plant—discounting laboratory yield 33-1/3 per cent equals 0.45.

3. Hempel Distillation of Pressure Distillate Re-run

	Test No. 1.	Test No.2.
Gravity of Charge	46.8	50.7
		Yields
Over to 310° F.	38.4%	48.7%
310-365° F.	19.0%	15.8%
Bottoms	41.5%	34.0%
Loss	1.1%	1.5%
	100.0%	100.0%

Distillation Test on Naphtha Cut Test No. 1.

		Temp. Off	Per Cent Off
Gravity	46.9		
Initial Boiling Point	304		
10	317		
20	322		
30	326		
40	330		
50	334	380—	95.0
60	339	392	97.0
70	345		
80	352		
90	366		
92	370		
95	380		
97	393		
Maximum	404		

Note: Sample was dumped by accident before other physical tests could be made.

Distillation Test on Naphtha Cut Test No. 2.

		Temp. Off	Per Cent Off
Gravity	46.8		
Initial Boiling Point	306		
10	317		
20	322		
30	326		
40	330		
50	334	380	94.0
60	339	392	96.0
70	346		
80	354		
90	366		
92	374		
95	386		
97	398		
Maximum	402		
Color	Plus 21		

Flash Tag-Open Cup ..115°F.
Fire Tag-Open Cup....130°F.

Yield—Test No. 1.

Per cent of Stoddard Solvent obtained from charging stock to pressure stills, considering the pressure distillate re-run to be 54% of the pressure distillate and the pressure distillate 77% of

Do You Know

The MARLEY SPRAY NOZZLE

Gives better spraying and less clogging than other commercial nozzles.— Operates with low pressure.

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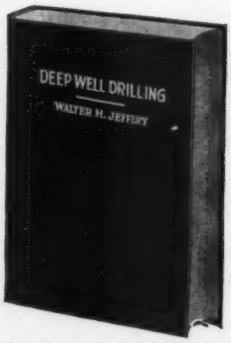

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the charging stock—based on laboratory distillation 7.9%.

Based on plant yileds—33-1/3% less than lab. yields 5.3%.

Yield—Test No. 2.

Per cent of Stoddard Solvent—laboratory yield 6.6%; plant yield 4.4%.

4. **Hempel Distillation of Pressure Distillate.**

(77% of Charging Stock)

Gravity of Charge 46.7

Yields

Over to 307° F.	35.1%
307-375° F.	13.0%
Bottoms	50.9%
Loss	1.0%
	100.0%

Distillation Test on Naphtha Cut

		Temp. Off	Per Cent Off
Gravity	46.5		
Initial Boiling Point	289		
10	322		
20	325		
30	328		
40	332		
50	336		
60	341		
70	347		
80	355		
90	369	392	96.0
92	—		
95	385		
97	398		
Maximum	403		

Note: Additional physical tests were not made because it was seen that the product was "off-color."

Yield

Per cent of Stoddard Solvent obtained from charging stock to pressure stills, considering the pressure distillate to be 77% of charging stock—based in results of laboratory—

Hempel distillation 0.13x77 equals 10.0*

Based on yields that would be obtained in plant —

(33-1/3% less than lab. yields ... 6.7

5. **Hempel Distillation of Re-run Distillate cut from Salt Creek Crude. (Re-run distillate cut represented a 50% cut from the Crude made by a combined fire and steam distillation.)**

Gravity of Charge 44.8

Yields

Over to 310° F.	33.1%
310-370° F.	12.3%
Bottoms	54.2%
Loss	0.4%
	100.0%

*Laboratory yield 7.9% (based on charging stock) and approximate plant yield of 5.3% (likewise based on charging stock) is believed to be more nearly correct.

Distillation Test on Naphtha Cut

		Temp. Off	Per Cent Off
Gravity	46.5		
Initial Boiling Point	295		
10	308		
20	312		
30	318		
40	324		
50	328	380	93
60	334	392	96
70	342		
80	352		
90	370		
92	376		
95	388		
97	406		
Maximum	410		
Color	Plus 25		

Flash-Open Cup .....105°F.

Fire-Open Cup .....120°F.

Yield

Per cent of Stoddard Solvent obtained from Salt Creek crude oil—based on the results of a laboratory Hempel distillation test, 0.5x12.3 equals 6.1.

Per cent of Stoddard Solvent from Salt Creek crude oil that would be obtained in plant—discounting laboratory yield 33-1/3% 4.0.

6. **Hempel Distillation of First Stream of Continuous Battery Running on Lost Soldier Crude oil (7% of Crude.)**

Gravity of Stream 52.4

Yields

Over to 303° F.	80.0%
303-328° F.	7.0%
328-375° F.	7.0%
Bottoms	5.4%
Loss	0.6%

Distillation Test on Naphtha Cut on Hempel Between 303-328°F.		Distillation Test on Naphtha Cut on Hempel Between 328-375°F.	
Gravity	44.3	Gravity	40.4
Initial Boiling Point	296	Initial Boiling Point	330
10	302	10	340
20	304	20	343
30	307	30	345
40	310	40	348
50	313	50	351
60	316	60	353
70	320	70	357
80	324	80	362
90	334	90	370
92	339	92	372
95	346	95	380
97	—	97	390
Maximum	361	Maximum	400

Combining these two cuts would give a fraction that would meet satisfactorily the distillation specifications for this grade of naphtha. This would be 14 per cent of the first stream, or a laboratory yield of approximately 1.0 per cent from the crude.

In connection with the above results, it should be remarked that this work was conducted at an altitude of 6700 ft., and that, therefore, all distillation figures are about 15 degrees lower at all points than would be the case if the distillation tests had been made on the same product at sea level. The results of flash tests made at this higher altitude are also considerably lower than the results that would be obtained on the same product if made at sea level. The difference in this particular case is very nearly the same difference that results from the use of a Tag-Open cup and a Tag-Closed Cup tester. Hence, it was considered that the information obtained from these tests gave a fair idea as to the possibility of making a cleaning solvent that would be not under 300 degrees F. initial boiling point and not over 400-410 degrees F. end point, and, **at the same time,** be not under 105 degrees F. flash test.

Below is shown in tabular form the relationship between boiling range and flash point on the products obtained by running distillation tests on the samples previously mentioned:

	1.	2.	3.	5.
Initial boiling point °F.	301	294	306	296
End Point deg. F.....	401	397	402	410
Flash Tag-Open Cup °F.	110	105	115	105
Fire Tag-Open Cup °F.	125	120	130	120

Conclusions

1. It is possible to make Stoddard Solvent from crude oils, as, for example, Lost Soldier or Salt Creek crude oils; but, because of color, odor and unsaturated hydrocarbon specifications, it can not be made, economically, from pressure distillate or re-run distillate containing any "cracked" hydrocarbons.

2. The margin between the flash specification and the distillation range is so small as to give the refiner almost no leeway whatsoever. This places an unnecessary hardship upon the refiner in his efforts to manufacture such a product. Furthermore, a minimum flash specification of 95 degrees F. eliminates the danger of fires from static discharges equally as much as does a flash specification of 105 degrees F., thus causing the latter to appear as too rigid a specification.

3. Although it is **possible** for such a cleaning solvent to be made, it is not practical for the average refiner to attempt to make it unless he specializes on the manufacture of cleaning solvents and naphthas. The small refiner can not afford to sacrifice still capacity, because of the necessity of additional re-running, and storage capacity, and to take the precautions from contamination, etc., that are necessary in order to make Stoddard Solvent. For these reasons, and the fact that a worthwhile market for Stoddard Solvent was not assured, the manufacture of this product was **not** recommended by the writer to the refiner who had been giving consideration to the advisability of marketing such a cleaning solvent.

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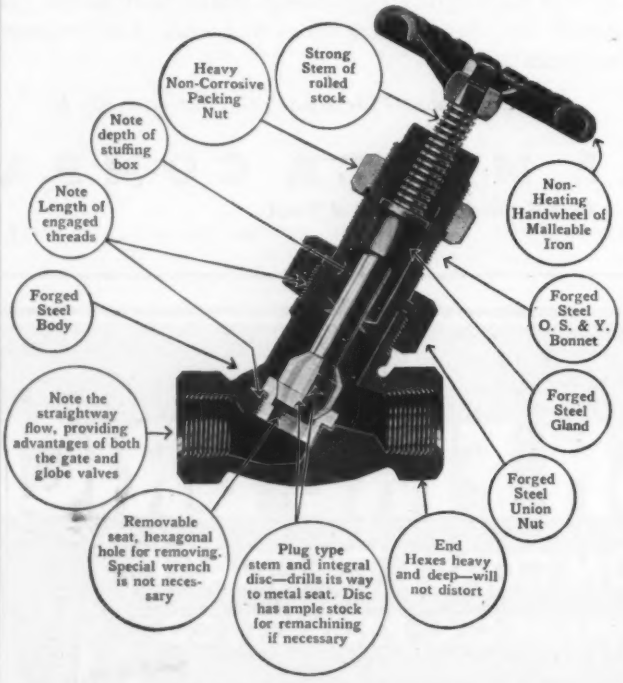
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& Cleaners' Association—by the rigidness of the specifications that they have laid down for a cleaning solvent—may, in time, defeat what has made possible heretofore the use of a petroleum cleaning solvent, namely, that it was the most economical of all solvents that have ever been used. In other words, by "bearing down" on the petroleum refiner with the specifications that they have adopted, they are merely "bearing down" on themselves by the price that members of the association will have to pay for the product. And as the writer has personal knowledge of many cleaning establishments who continue to use a naphtha of 200 degrees F. initial boiling point and of 400 degrees F. end point, it would seem that Stoddard Solvent has not as yet been popularized among those who are conducting the very business represented by the National Association of Dyers & Cleaners.

Making Safety Pay

Los Angeles, Calif.—Does first aid actually pay? That questions is to be answered affirmatively, according to the Pacific Gasoline Company. It saved two lives the other day.

Reports have reached that organization recently of three instances where members of the company who had taken first aid courses in all probability saved two lives and relieved the painful injuries of another.

While I. W. Willard, foreman at the company's Dominguez, California plant, was visiting in the East recently an electrical storm took place. He was called next door to look at a man who had been struck by lightning and was apparently dead. Without losing any time, Mr. Willard applied artificial respiration and treatment for shock. The man regained consciousness and fully recovered. Without this treatment the man undoubtedly would have died, as he had already ceased to breathe when Mr. Willard reached him.

Another instance recently occurred on the highway near Taft when S. R. Phillips was able to stop arterial bleeding of a person injured in an automobile accident. The injury would have proved fatal had first aid not been applied.

The other day W. C. Osterbauer had occasion to put his knowledge to practical use on the Bakerfield highway when he treated a woman suffering from broken bones and shock sustained in an automobile accident.

Quigley Selects Boston Firm for Distributor

The Eagle Oil & Supply Company of Boston has been appointed distributor for Quigley Furnace Specialties Company, Inc., of New York. The Boston distributor will have the territory including eastern Massachusetts and Rhode Island. Quigley products, including Hytempite, acid proof cement, Quigley refractory gun and Triple-A protective solutions, will be carried in stock.

Recent Refinery Patents

Washington, D. C.—The following patents of interest to the refining industry have been issued by the United States Patent Office:

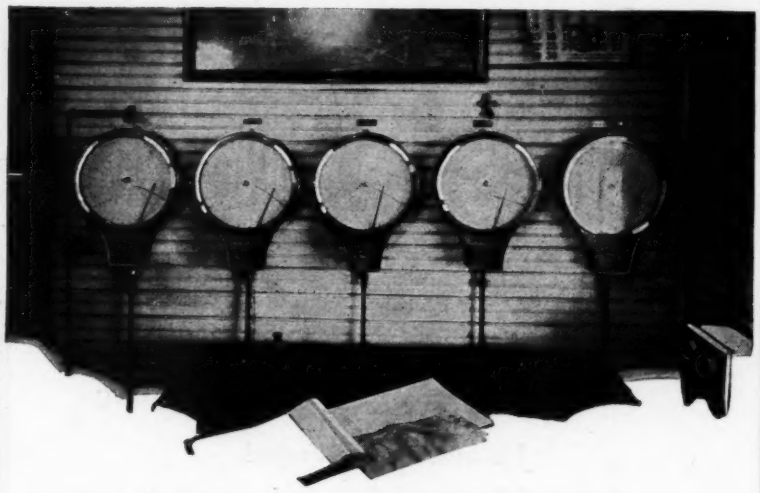
No. 1,592,929, issued July 20 to Walton H. Elliott, Port Arthur, Tex., assignor to The Texas Co., New York, for a condenser comprising a coil consisting of an outer pipe containing within it a pipe of less diameter so as to form an annular space around the several convolutions of the inner coil, means for supplying the fluid to be cooled to the upper end of the inner coil, means for withdrawing the cooled fluid from the lower end, means for introducing a cooling fluid at the lower end of the outer piping, openings in the top pipe of said coil to allow the cooling medium to be discharged whereby it may flow back over the coils, a pan for collecting the backflowing medium and means for returning said medium to the condenser.

No. 1,593,040, issued July 20 to Donald R. Stevens and Samuel P. Marley, Pittsburgh, and William A. Gruse, Wilkinsburg, Pa., assignors to Gulf Refining Co., Pittsburgh, for a process of improving motor fuel as regarding knocking qualities which comprises treating a material containing an aluminum halide with a combustible organic liquid, removing the liquid and adding such liquid product to motor fuel.

No. 1,593,107, issued July 20 to Thomas W. Sowell, Dallas, Tex., assignor to The Portable Refinery Co., Dallas, for a portable refinery consisting of a plurality of independently portable units adapted to be assembled in a longitudinal series for transportation and to be disposed side by side for cooperative use, each unit comprising a connected oil still, cooling tower, and a condenser spaced from the still, and detachable pipe connections extending from one unit to the other, whereby the products may be succesively passed to the units.

No. 1,593,275, granted July 20 to Berry V. Stoll, Louisville, Ky., for a process of cracking oil which comprises subjecting oil in a heating coil to a cracking temperature of from approximately 700 degrees F. to 750 degrees F. under a pressure of approximately 150 pounds per square inch, and allowing the product to expand in a cylinder still at a temperature of approximately 400 degrees F. to 500 degrees F., under a pressure of approximately 100 pounds per square inch.

No. 1,593,333, granted July 20 to James Rankin Garrow, Wimbledon, London, Eng., for a method of producing in liquid form and at a low temperature from carbonaceous materials



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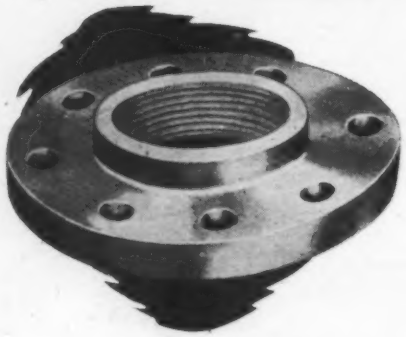

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hydro-carbon oils, together with the production or recovery of a large volume of gas suitable for illuminating or power purposes, which consists in passing in a continuous manner through a rotating retort the carbonaceous materials which are to be distilled, withdrawing a controlling volume of producer gas at a temperature not exceeding 600 degrees C. from an adjacent producer and passing the heated gas without previous ignition and in the form of a continuously flowing stream through the retort in counterflow to the carbonaceous materials passing therethrough so that the sensible heat of the gas is utilized for the purpose of effecting distillation, in withdrawing the combined retort and producer gases thus formed to condensing means so as to recover in liquid form from the retort gases the hydrocarbon oils contained therein, and in conducting away the combined retort and producer gas from the condensing means for combustion elsewhere.

No. 1,593,762, granted July 27 to Moritz Joseph Heitmann, Potschappel, near Dresden, Germany, for an emulsion of a hydrocarbon oil and water, said hydrocarbon oil having been preliminarily treated by electrical discharges, which emulsion is free of substances other than such treated oil and water, and is stable.

No. 1,593,893, granted July 27 to Richard J. Barry, Houston, Texas, for a method of separating emulsions of water and oil comprising placing the emulsion in a container, adding thereto small quantities of salt and diatomaceous clay, heating the mixture and drawing off the oil.

No. 1,593,905, granted July 27 to Joseph W. Lewis, Philadelphia, assignor to The Atlantic Refining Company, Philadelphia, for an oil-treating apparatus comprising a vertical still, heat absorption structure comprising a plurality of tubes; connections from the lower and upper ends of said tubes to said still at different levels thereof, and means maintaining super-atmospheric pressure in said still and tubes, of valves in said connections, and means for actuating said valves to open or closed positions simultaneously; and the combination with pressure still structure comprising an oil containing chamber, heat-absorption structure, a connection between them, and means for maintaining super-atmospheric pressure in said chamber and heat-absorption structure, of a valve in said connection, a by-pass around said valve, and a check valve in said by-pass.

No. 1,594,014, granted July 27 to Julius E. Kobernic, Fullerton, Calif., assignor to Newton Process Manufacturing Company, Fullerton, for a process of distilling and blending hydrocarbons comprising causing a repeated intimate contact between a hot lean hydrocarbon gas and a hot absorbing medium containing hydrocarbons, cool-

ing the gas and the absorbing medium and again causing a repeated intimate contact between the gas and the absorbing medium and distilling the absorbing medium to recover a commercial stabilized gasoline.

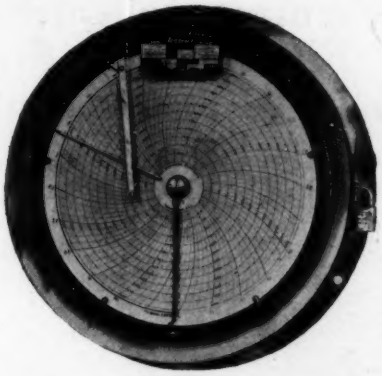
No. 1,594,041, granted July 27 to Henry J. Broderson and William E. Bartels, Whiting, Ind., assignor to Standard Oil Co., Whiting, for a mixing devision consisting of a conduit through which material to be treated flows, a hollow head within said conduit having an opening directed in the direction of a flow of liquid through the conduit, a valve member within said head for controlling the size of the opening and a conical member secured to said valve member exteriorly of the head and larger than the opening for controlling the direction of flow of material passing through said opening and means for supplying a treating reagent to the interior of said head.

No. 1,594,083, granted July 27 to Gerald L. Wendt, Chicago, assignor to Standard Oil Co., Whiting, Ind., for a method of refining distillate oils containing products within the gasoline and kerosene boiling point range comprising treating such oils with doctor solution, and subsequently distilling the treated oil by bringing the oil under atmospheric pressure to a maximum temperature not exceeding 400 degrees F., and continuing the heating of said oil with reduction of pressure and without exceeding said maximum temperature thereby causing its distillation to proceed.

No. 1,594,093, granted July 27 to Carbon P. Dubbs, Wilmette, Ill., assignor to Universal Oil Products Co., Chicago, for a process for cracking hydrocarbon oil consisting in raising the oil to a conversion temperature in a heating zone, collecting the heated oil in a substantial body in a vaporizing zone and causing the heating and vaporization to take place under substantial pressure of the evolved vapors, the vapors to a dephlegmating zone and there subjecting them to the refluxing action of the incoming raw oil, passing the uncondensed vapors under reduced pressure conditions to successive fractionating zones, condensing and collecting the uncondensed vapors passing over from the final zone and returning selected portions of the condensate from each of the separate fractionating zones to the preceding fractionating zone.

No. 1,594,209, granted July 27 to Percy Mather, London, Eng., for a method of evaporation consisting in causing the liquid to flow in a descending course, intercepting the liquid to form pools at successively lower levels, the liquid flowing successively from pool to pool, applying heat laterally to the liquid in its course, liberating the vapors from the liquid in the pools at the side away from that at which heat is applied and shielding the vapors substantially as described.

No. 1,594,296, granted July 27 to



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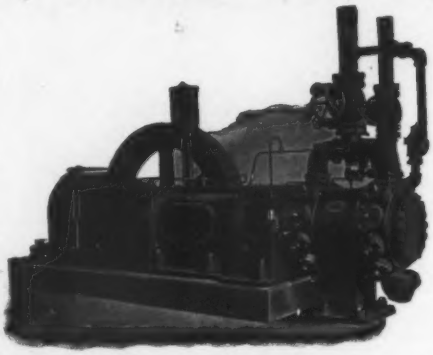

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No. 1,594,625, granted August 3 to James M. McClave, Denver, assignor to Bituminous Sand Company, Denver, for a process of treating material containing hydrocarbons and gangue to separate the former from the latter comprising adding to the material in the presence of water a colloidal clay which when mixed with water forms a gelatinous mass, and recovering the hydrocarbons.

No. 1,594,666, granted August 3 to Paul Danckwardt, Denver, for a process of producing hydrocarbons of low boiling points from hydrocarbons of higher boiling points, which consists in passing the vapors and gases from a cracking still through a mixture of molten sodium hydroxide and nickel.

No. 1,594,762, granted August 3 to Morris C. Van Gundy and Howard Dimmig, Port Arthur, Texas, assignors to The Texas Company, New York, for a process of manufacturing lubricants which comprises gradually heating a mixture of oleic acid and lead oxide to approximately 520° F.-525° F., maintaining that temperature until no free acid is present and compounding the resultant product with lubricating oil.

No. 1,594,795, granted August 3 to George Jewett Rockwell, Huntington Park, Calif., assignor of one-half to Colin Timmons, Los Angeles, for a process of separating hydrocarbons from oil bearing earth which consists of partially distilling the oil bearing earth for removal of some of the lighter oils, agitating the materials in the presence of water and steam heat by which oil would be freed from the grains of sand by attrition and gently agitating and heating by steam to permit stratification of the oil, water and sand according to their specific gravities.

No. 1,594,823, granted August 3 to Carleton Ellis, Montclair, N. J., assignor to Seth B. Hunt, trustee, Mount Kisco, N. Y., for a process of treating hydrocarbon gases consisting in passing casing head or gas or natural gas through a heated zone under a pressure sub-atmospheric to form olefines and in

passing the gases thus produced into sulphuric acid under sulfating conditions whereby an extract is obtained which on hydrolysis yields alcoholic bodies.

No. 1,594,915, granted August 3 to Horace M. Weir, Elizabeth, N. J., assignor to Standard Development Co., of Delaware, for a process of manufacturing gasoline which comprises effecting the absorption of gasoline constituents of a gas in a suitable solid absorbent, subsequently heating the absorbent to drive out the gasoline constituents absorbed therein, passing the said gasoline constituents in vapor form through a body of heated hydrocarbon oil distillate containing gasoline and heavier constitutents and condensing the collecting the vapors evolved therefrom.

No. 1,594,957, granted August 3 to Frank A Howard, Westfield, N. J., and Edgar M. Clark, New York, assignors to Standard Development Company, of Delaware, for a process of distilling liquid hydrocarbons or like supbstances immiscible with water consisting in passing the same progressively through a plurality of stills in which successively heavier fractions are removed in successive stills, introducing steam into the stills in which the heavier fractions are removed, removing and cooling the vapors evolved in such stills, withdrawing therefrom vapors containing at least 50 per cent of steam, compressing said vapors and introducing the compressed vapors into stills in which lighter fractions are removed, and removing and condensing the vapors from said last mentioned stills.

No. 1,595,179, granted August 10 to Gustaf Egloff and Harry P. Benner, Chicago, assignors to Universal Oil Products Co., Chicago, for an apparatus for treating oil consisting of a rotary still member, a stationary still member, and transfer line connecting said still members, means for independently heating the upper part of each still member, means for taking off vapors from one of said still members, and means for maintaining a pressure on said still members.

No. 1,595,332, granted August 10 to Joseph H. Adams, Brooklyn, N. Y., assignor to The Texas Company, New York, for an apparatus for converting high boiling hydrocarbon oil into lower boiling products comprising a supply tank, a furnace, a plurality of vertically disposed converter tubes extending through the upper and lower walls of the furnace and heated intermediate their ends to cracking temperatures, a carbon and residue collecting chamber connected to the lower ends of the converter tubes below the heating zone, a vapor and liquid separating chamber directly connected to the upper ends of the converter tubes above the heating zone, and embodying a plurality of interconnected overflow pipes immersed in the liquid therein for assisting the liberation of vapors and maintaining a predetermined oil level therein, means

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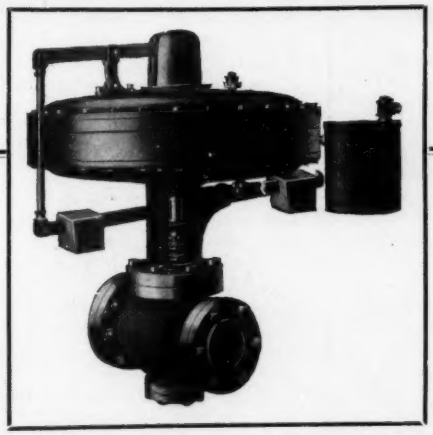

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for connecting the supply tank, the carbon and residue chamber, the converter tubes and the liquid and vapor separating chamber in a closed circulatory system, means for removing the evolved vapors liberated from the oil in said liquid and vapor separating chamber and means for maintaining superatmospheric pressure throughout the system.

No. 1,595,455, granted August 10 to Melvin de Groote, St. Louis, and Wilbur C. Adams, University City, Mo., assignors to Wm. S. Barnickel & Co., Webster Groves, Mo., for a process for treating petroleum emulsions, characterized by subjecting the emulsion to the action of a modified carbohydrate condensation derivative in which the carbohydrate group bears a simple genetic relationship to the parent material.

No. 1,595,456, granted August 10 to Melvin de Groote, St. Louis, and Wilbur C. Adams, University City, Mo., assignors to Wm. S. Barnickel & Co., Webster Groves, Mo., for a process for treating petroleum emulsions, characterized by subjecting the emulsion to the action of a modified protein condensation derivative in which the protein group beras a simple genetic relationship to the parent material.

No. 1,595,457, granted August 10 to Melvin de Groote, St. Louis, and Edward H. Keiser, Clayton, Mo., assignors to Wm. S. Barnickel & Co., Webster Groves, Mo., for a process for treating petroleum emulsions, characterized by subjecting a petroleum emulsion to the action of a treating agent composed of an insoluble salt of a modified organic soap-forming material, which bears a simple genetic relationship to the parent material from which it was derived.

No. 1,595,642, granted August 10 to Edgar M. Clark, New York, and Frank A. Howard, Elizabeth, N. J., assignors to Standard Development Co. of Delaware, for a method of fractionally condensing hydrocarbon oil vapors which consists in passing said vapors successively through a plurality of heat exchanges, introducing water at substantially its boiling point into one of said heat exchangers in indirect heat-conductive contact with said hydrocarbon oil vapors, causing the water to travel through said condenser in the same direction as the hydrocarbon oil vapors, the water being converted into steam therein, delivering the generated steam to another of said heat exchangers through which the hydrocarbon oil vapors pass in indirect heat-conductive contact therewith before entering the first heat exchanger, admixing water at substantially its boiling point with said steam before it enters the second mentioned heat exchanger and passing the mixed steam and water through the latter heat exchanger in a direction opposite to that of flow of the hydrocarbon oil vapors therethrough.

No. 1,595,681, granted August 10 to George G. Oberfell, New York, assignor by mesne assignments to Gasoline Recovery Corp. of Delaware, for a process of recovering gasoline from natural gas, which consists in contacting the natural gas with activated carbon whereby the gasoline is absorbed by the carbon, then subjecting the carbon and the absorbed gasoline to a distilling treatment to vaporize the gasoline and finally condensing the gasoline vapors.

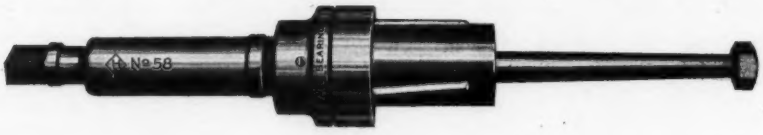
No. 1,595,682, granted August 10 to George G. Oberfell, Tulsa, Okla., and George A. Burrell, Pittsburgh, assignors to Gasoline Recovery Corp. of Delaware, for a process of removing hydrocarbon vapors from a gas mixture and recovering them in liquid form, which consists in passing the gas mixture through a solid absorbent medium consisting of activated charcoal which absorbs the vapors, then subjecting the solid absorbent to heat, while under a pressure to drive the absorbent vapors out of the absorbent, then condensing a portion of the vapors driven off, at a relatively low temperature, then compressing the remaining portion of said vapors at a pressure greater than that of the atmosphere and condensing the same.

No. 1,595,683, granted August 10 to George A. Burrell, New York; George G. Oberfell, Tulsa, Okla., and Clyde L. Voress, Bradford, Pa., assignors to Gasoline Recovery Corp., of Delaware, for a process for the recovery of mineral oil vapors from gaseous mixtures containing mineral oil vapors having individual boiling points which form a list of temperatures varying at the extremes over a range of 10 degrees F. or more, which consists of contacting a gaseous mixture with particles of activated carbon wherein a portion of the mineral oil vapors are absorbed within a fraction of a second after such contact, then passing more of the gaseous mixture so that the lower boiling vapors are gradually revolatilized and higher boiling oil vapors absorbed until such time as the mineral oil vapors which are desired for recovery are held and the majority of the lower boiling vapors are excluded, then introducing a volatilizing agent directly into said charcoal for distilling the absorbed vapors, then separating the condensed portion of the vapors from said volatilizing agent by the action of gravity, and condesning the second portion of the vapors subsequently to the first condensation by cooling or pressure and cooling.

No. 1,587,111, granted June 1 to George L. Fogler, Tulsa, Okla., for a method of treating emulsified oil that comprises establishing a moving stream of the oil, adding water to the said stream, rotating the mixture about its axis while advancing, and permitting said mixture to separate by gravity.

No. 1,587,256, granted June 1 to Julius H. Toupet and Vanton O. Foulk, Pittsburgh, Pa., said Toupet assignor to said

HEAVY DUTY EXPANDERS FOR STILL TUBES



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Beading Tools for Still Tubes
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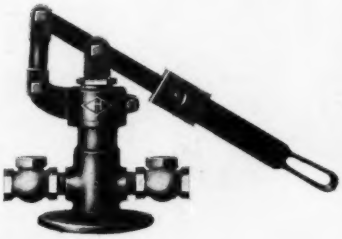

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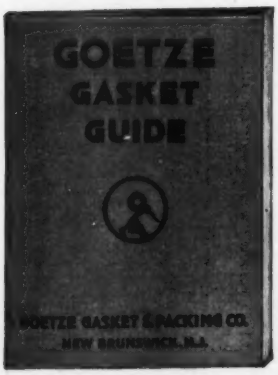

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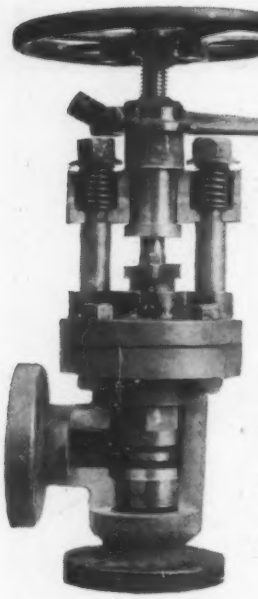

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Always tight.
Saves Fuel by
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Wears in while
others wear out.

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packed and re-
ground under
pressure.

Also screwed
and
straightway

Semi-Steel for pressures up to 250 lbs.
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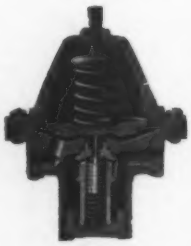

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No. 1,587,370, granted June 1 to Frank M. Floyd, Dallas, Texas, for an apparauts for refining hydrocarbon materials consisting of a still, means for supplying a hydrocarbon material to the still, a reflux condenser, means communicating the lower end of the reflux condenser with the still, a coil within the reflux condenser, an inlet conduit leading upwardly within the reflux condenser from the bottom of the coil and exiting from the reflux condenser at the top thereof, and an exit conduit connected to the top of the coal and leading downwardly through the reflux condenser and exiting through the bottom of the reflux condenser and leading into said still and having an outlet adjacent to the bottom of the still.

No. 1,587,491, granted June 1 to Roy Cross, Kansas City, Mo., for a process of treating petroleum oil, consisting in heating and vaporizing the oil under substantial pressure, passing the evolved vapors through a mixture of bentonite and a salt of a metal having an affinity for the sulphur compounds of the oil while maintaining the mixture above the dry point of the oil, and condensing and collecting the treated vapor as liquid distillate.

No. 1,587,649, granted June 8 to Ernst M. Johansen, Fall River, Mass., assignor to The Atlantic Refining Co., Philadelphia, for a method of desulphurizing oils consisting of blending oils containing, respectively, sour and corrosive sulphur, and subjecting the mixture to the action of sodium plumbite

No. 1,587,899, granted June 8 to Robert A. Carroll, West Finley, and Henry L. Elliott, Washington, Pa., assignors of one-third to James V. Elliott, Buffalo Township, Pa., for a blended motor fuel comprising aromatic hydrocarbon distillates substantially free from sulphur, and having boiling points not over 300 degrees F., petroleum distillates having boiling points not over 300 degrees F., a lower readily volatile monohydric alcohol, a readily volatile terpene compound, napthalene and water, the last mentioned four being together equal to not over about 7 per cent of the entire mixture, such product being in the form of a homogeneous stable mixture.

No. 1,588,308, granted June 8 to Louis Bond Cherry, Kansas City, Mo., assignor by mesne assignments to C. & C. Development Co., Kansas City, Mo., for a method of subjecting oil to cracking temperature at a cathode while subjecting the oil to an ionizing electric current flowing therethrough from an anode to said cathode.

American Arch Company Expands Organization

New York City.—Announcement was made a short time ago by the American Arch Company, Inc., of this city, that their organization had taken over, under an exclusive agreement, the business of the Waite and Davey Company of Long Island City.

Waite and Davey Company manufactures patented air cooled refractories that are being used in the refining industry with much success. The air cooled block is applicable to a wide range of furnaces and has been found satisfactory with oil or gas as fuel.

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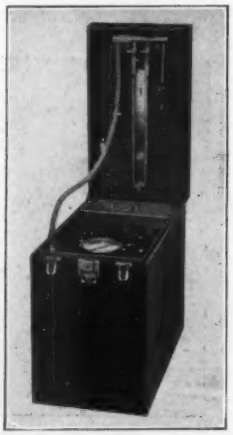

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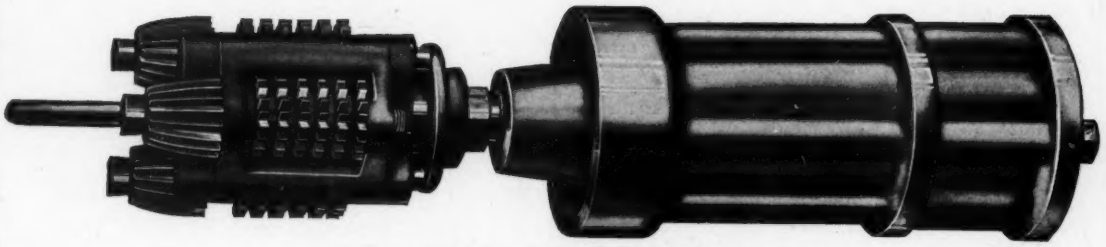

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For

CRACKING STILLS

The Roto Company

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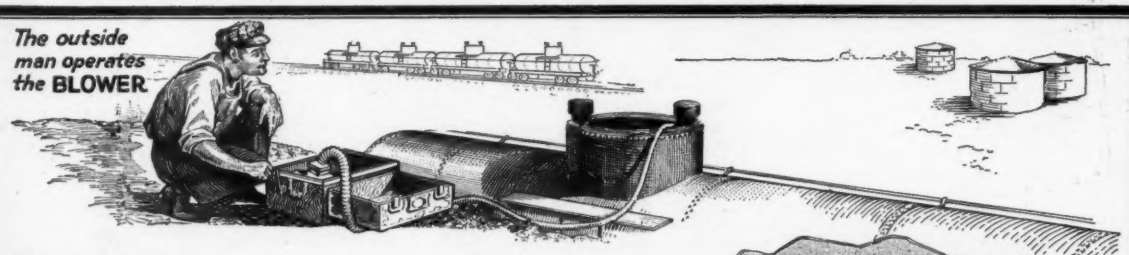

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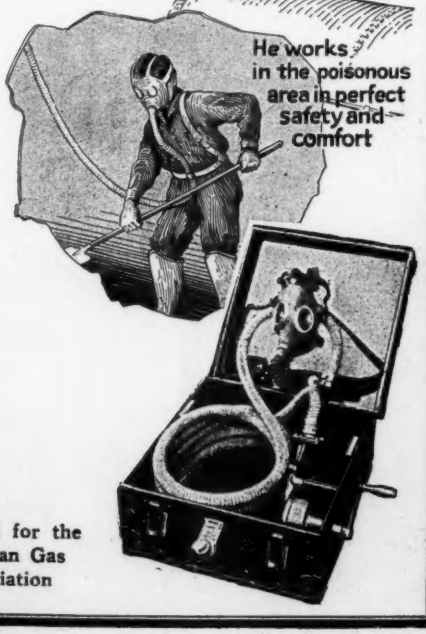

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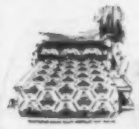

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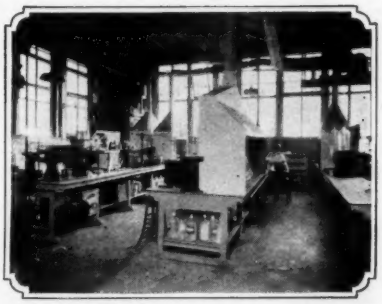

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